SCIENTIFIC AMERICAN

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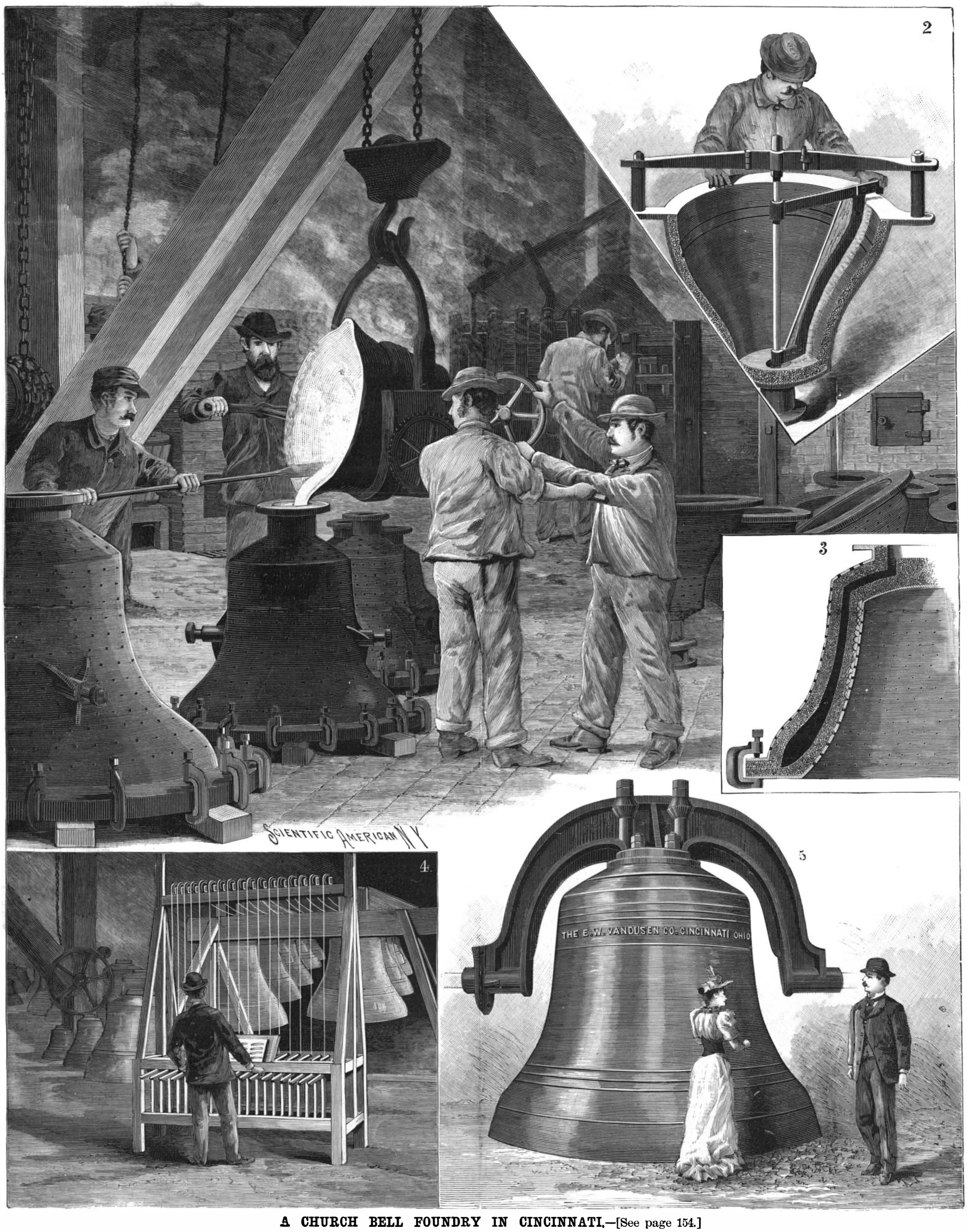

A CHURCH BELL FOUNDRY IN CINCINNATI.—[See page 154.]

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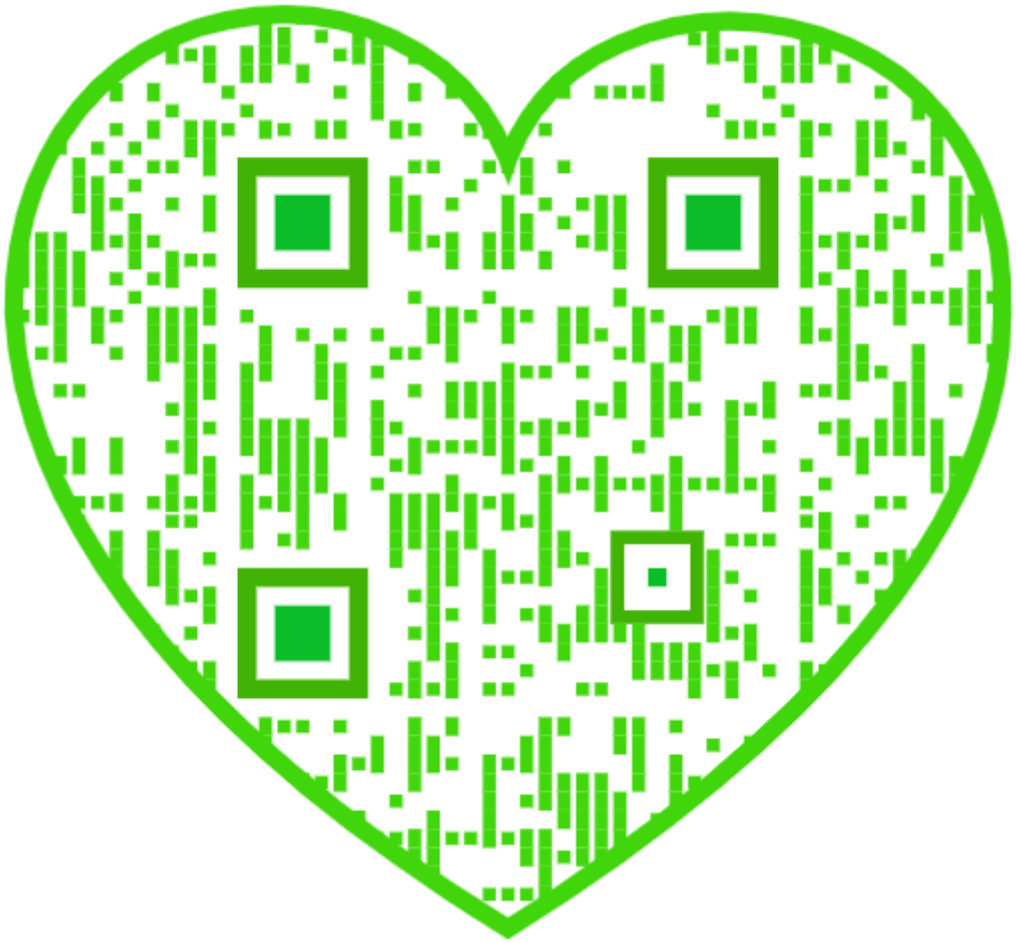

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ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, AND AFFILIATED SOCIETIES, AT SPRINGFIELD, MASS., AUGUST 29, 1895.

Among the many papers offered at the preliminary meetings two brought before the Entomological Society attracted general attention for local as well as scientific reasons. One of these was about that imported pest, the Gypsy moth, whose ravages it is costing so much to hold in check. The moth was introduced into this country twenty-six years ago by the astronomer Trouvelot, of Medford, Mass., who was at that time experimenting in raising silkworms. He placed his moths on some shrubs as soon as they arrived from France and covered them with mosquito netting; but during a storm the netting was blown away and the insects escaped. Professor Fernald, of Amherst, told the story of the subsequent spread of this moth and of what was being done for its extermination. He said that the species spread rapidly, eating all the leaves and killing all the trees in the vicinity. They would spread over a house so thickly that one could not tell the color of the paint, and they covered the sidewalks so that one could not step without killing numbers of them. The public became alarmed. Bulletins were sent out and copies of the official report were sent to every voter in Massachusetts. Commissions were appointed and large appropriations were made by the legislature. Experts were consulted by whose advice Professor E. H. Forbusch was made field director, while Professor Fernald was retained as special entomologist. It was found that native parasites were at work on the moths; but it was not thought best to wait for the result of their work. Paris green was used and numerous other insecticides. Finally it was found that the arsenate of lead could be used effectively in large quantities and without injury to the trees. Waste lands may be burned over to advantage. The eggs can be killed by a combination of carbolic acid and creosote. The territory now infested covers 200 square miles in thirty towns and cities. The female does not fly but crawls at the rate of 142 feet a day, and will eat 200 square feet of lettuce during its lifetime of twelve weeks. The subject was discussed by Professors Riley, Forbusch, Lintner, and others, and a resolution unanimously passed approving the work already done by the Gypsy Moth Commission and urging the State to give it all needed support and encouragement.

The elm leaf beetle and the methods of his extermination was handled by Professor L. O. Howard. This pest is comparatively new in New England, though it has been at work in Washington and other Southern cities for forty years. But it is spreading up the Hudson and along the Connecticut River, and is far more deadly at the North than it has been in the South. Handsome old trees have been killed by it in three consecutive years, because the shortness of the season gives them no chance for refoliation such as there would be in the longer summers of Virginia. Arsenical spraying is the most effectual remedy, especially if combined with scraping and the use of kerosene to kill the larvæ around the base of the tree. This may be trite instruction, but the main thing is to get people to do the practical work needed. It is a striking fact that in most of our cities no appropriations are made for the care of our noble shade trees. Every city should set apart from $1,000 to $2,000 annually to the killing of shade tree insects, and for many places it would be economical to provide a steam spraying apparatus throwing from four nozzles as many gallons a second. Something has been done by private enterprise, as at Bridgeport, where more green elms can be seen than in other neighboring cities as the result.

Mr. W. S. Bullard is a pioneer in this work. But public sentiment should be aroused to demand the appointment of regular city foresters with sufficient funds. Beware of patented or secret mixtures, like those sold by the Norwalk Tree Inoculating Company, whose preparation is simply sulphur and carbon, and is wholly useless. Professor C. L. Marlatt also read a paper on the elm leaf beetle in Washington, claiming that early and thorough spraying was the key to the situation there and elsewhere.

A report of the meeting of the Geological Society of America will be found in the current number of our SUPPLEMENT.

Passing over the proceedings of the other affiliated societies, full as they were of material for thought and additions to knowledge, we come to the beginning of the sessions of the parent Association for the Advancement of Science, without which the minor organizations might not have sprung into existence, or at least would not have been grouped thus delightfully together. The duty of preparing the general business devolves on a council, to whose intelligence and activity we owe the success of every detail. They depend in turn, for the local features, on the committee of the citizens of Springfield, who engaged the halls for the meetings and planned various excursions, and did other work that costs much thought, considerable money and great patience and wisdom. Every attention that could be desired was paid to the distinguished scientific guests, together with the less brilliant seekers after truth who perhaps may shine in future assemblies. Indeed it is interesting to note the number of young persons who avail themselves of these privileges.

The reception at the Art Museum on Wednesday evening, August 28, was given by the City Library Association, of which Colonel James A. Rumrill is the president, and the occasion was made remarkable by the opening of the G. W. V. Smith collection of paintings, ancient armor and costly implements of warfare of many nations, an attraction of which Springfield is justly proud. Mr. and Mrs. Smith, and the artist, Mr. T. W. Wood, of New York, were present and assisted in receiving and entertaining the hundreds of guests.

After President Brinton's annual address on Thursday evening, read in his absence by the general secretary, another fine reception was given in City Hall by the Ladies' Reception Committee. The preparations were elaborate and the floral decorations and music were charming. The hours were spent altogether socially, in renewing old friendships and making new ones.

The General Sessions of the A. A. A. S. began on Thursday morning, August 29. A letter from the retiring president, Dr. Brinton, stated that he was detained in Europe on account of Mrs. Brinton's health. In his absence the duty devolved on Professor W. H. Brewer, of Yale University, to introduce the president-elect, Professor E. W. Morley, of Cleveland, Ohio, which he did with some complimentary remarks on the eminent services rendered by the latter to science. He was formerly an assistant to the famous Bunsen, in Heidelberg. He was one of the two men who solved Sir William Thomson's problems that excited so much attention at the time. He also won fame by determining the atomic weight of oxygen. He is now the professor of chemistry in the Western Reserve University, of Cleveland.

After thanking the association for the honor conferred on him, the president called on Rev. Bradley Gilman to offer prayer. Mr. William H. Haile was then introduced, who made a happy address of welcome, in which he was followed by Mayor Long, who briefly recounted the victories won by science since the association had last met in Springfield. President Morley made a reply in which he paid a tribute to the famous men of Western Massachusetts past and present. He also stated in brief the aims of the organization now convened, and in closing said: "We study the apple tree and also the lily, the latter because of its ministrations to the intelligence and to the æsthetic side of life. We are not warmer nor richer for knowing the distance of the sun, but some of us are happier for knowing it. So we, who are fascinated with science, ask you to receive us, not as engineers promising new structures of flying ships, or new conveniences with which to ornament our homes, nor as ethical teachers, but as men who can bring out the subtile influence of the lily, and appreciate the hidden beauty and meaning of what may seem to be abstract and almost unknowable things."

A Bromo-cyanide Process for Gold Extraction.

If a gold leaf be placed in a flask containing two or three ounces of water and a few grains of dissolved potassium cyanide, and a portion of the air be displaced by bromine vapor, the metal will be rapidly dissolved on shaking. Apparently the bromine displaces cyanogen, which, in the nascent condition, readily attacks the gold, while potassium bromate is formed, the following equation being provisionally suggested as expressing the reaction:

$$4Au + 8KCy + 2Br + O_7 + H_2O = 4KAuCy_2 + 2KBrO_3 + 2KOH.$$

With an excess of bromine, potassium bromide and hydrocyanic acid are formed; but the loss of acid may be prevented by the addition of alkaline hydrates. The quantity of the cyanide required is less than in the ordinary process, the action is more rapid, and the recovery of gold more complete. The reagents should be added in the correct proportion, calculated after carefully assaying the ore. In use, the fine ore may be kept agitated, the requisite amount of bromine being admitted intermittently; or the solution may be caused to percolate through the ore in presence of bromine vapor; or air and bromine together may be blown through the ore in the leaching solution. The bromine may be recovered by concentrating the solution after it has passed the zinc boxes, and treating it with hydrochloric acid, the evolved bromine being condensed.—Australian Mining Standard.

Photographic Plates.

In this process a layer of resinous soap is applied to the plate, before the coating with chrome gelatine, which latter should contain chromate of ammonia to which sal ammoniac has been added. The object is to produce a film having a durable and fine grain, and it is stated that with a film made in the manner described it is possible to take ten times the number of pulls as is now done without the grain losing its clearness.—W. H. C. Clasen, St. Petersburg, Russia.

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THE STARS IN SEPTEMBER.

The increasing popular interest in astronomy causes such an event as the total eclipse of the moon on the night between the 3d and 4th of September to receive more attention than would have been given to it say twenty years ago, although it really possesses little astronomical importance. The total phase begins about midnight and lasts about an hour and forty minutes. During the similar eclipse which occurred last spring the face of the moon was noticed, in many places, to be of a very pale red hue, and some anomalies were also noted in the coloration of the lunar disk at different periods of the eclipse. It is well understood that these colors seen on the eclipsed moon are due to the refraction of sunlight by the earth's atmosphere, and it will be both interesting and important to learn what peculiarities of a similar nature may be observed during this September eclipse. Fortunately thousands may make such observations, the requisites being, not instruments, but good eyes and a clear judgment.

The partial eclipse of the sun on September 18 does not call for special mention here, since it will not be visible in either America or Europe.

Venus, which has been so brilliant a visitor in our evening skies for several months past, disappears in the rays of the sun about the middle of September, to emerge later in the fall as a still more brilliant morning star. I have two or three times taken occasion in these columns to urge the importance of careful and systematic observations of Venus as being the planet which not only approaches the nearest to the earth in distance, but which the most closely resembles the earth in dimensions. Writing at present from Lucerne, I expect in a few days to visit Milan, and hope to meet there the famous Italian astronomer Schiaparelli, who a few years ago made very important observations concerning the rotation period of Venus. Anything interesting in his later studies of that planet I shall not fail to communicate in my next month's article. I may add that I have been talking with the French astronomer M. Janssen, who is just completing his observatory on the summit of Mont Blanc, and that he is firm in the opinion that not only Venus but Mars also possesses watery vapor in its atmosphere. And where the vapor of water exists we may expect clouds, rains, lakes, rivers, oceans and the living creatures that those things are fitted to nourish and support.

Venus arrives at conjunction between the earth and the sun on the 19th at about 1 A. M.

Mars and Saturn remain evening stars, but both are so far lost in the twilight that very interesting observations of them cannot now be made. Persevering observers, however, may still follow Saturn, which remains near the eastern end of Virgo. Jupiter is a morning star, and observations of the motions, eclipses, and transits of his satellites may be resumed by those who do not shrink from early rising. The requisite data for such observations will be found in the Nautical Almanac. Mercury, which was in superior conjunction with the sun on August 17, reaches its greatest elongation east of the sun on the last day of September, and may, about that time, be easily observed in the evening sky. It will be in conjunction with Venus on the afternoon of the 5th, but the conjunction will not be a close one. Mercury running about ten degrees north of its more brilliant neighbor. While there is so little to be made out in the telescopic observation of Mercury, yet that diminutive globe presents perhaps the most instructive example we have before our eyes of planetary revolution around the sun. Indeed, the swiftness of its movements continually surprises us if we do not follow them closely from week to week. Now it is east of the sun; in a few weeks it has disappeared either behind the sun or between the solar orb and the earth; in another few weeks it is as far west of the sun as before it was east, and so on in its breathless circuit. If there is a planet nearer to the sun than Mercury, its motions must be extraordinary indeed, for, as everybody knows, the closer to the sun the swifter the motion.

September opens with the moon between the phases of first quarter and full. The moon fulls on the 4th in Aquarius, and attains last quarter on the 11th in Taurus. New moon has its birth in Virgo, on the 18th, and reaches first quarter in Sagittarius, on the 25th. The moon is in apogee on the 3d, and also on the 30th, and in perigee on the 18th, a few hours before it partially eclipses the sun as noted above.

The lunar conjunctions with the planets occur as follows: With Neptune on the 11th, with Jupiter on the 15th, with Venus on the 18th, with Mars on the 19th, with Mercury on the 20th, with Saturn on the 21st, with Uranus on the 22d.

The sun enters Libra and the astronomical autumn begins at 2 o'clock on the morning of the 23d.

Among the telescopic attractions of the sky for September may be mentioned the wonderful star clusters and aggregations of stars and nebulæ to be seen in the little constellation of Scutum Sobieskii, and scattered all along the line of the Milky Way between Aquila and Sagittarius. Concerning these I may remark that I have been particularly struck with the gorgeous beauty of that part of the sky which they occupy, as seen with the naked eye and an opera glass from some of the lofty passes of the Alps this summer. Who can comprehend the sower of suns!

Particularly beautiful double stars to be observed are μ Cephei, whose components are white and blue; magnitudes, 4.5 and 5; distance apart, 3".8; and γ Delphini, in which the colors are a beautiful golden yellow and a greenish blue; magnitudes, 4 and 5; distance apart, 11".

For the location of these objects consult a star atlas.

GARRETT P. SERVISS.

EDWARD WILLIAMS MORLEY.

At this year's meeting of the American Association for the Advancement of Science a chemist was called to fill the place held last year by an ethnologist. Edward Williams Morley, who was chosen, was born in Newark, N. J., on January 29, 1838. He was educated at Williams College, where he was graduated in 1860. He turned his attention to teaching, chiefly chemistry, which soon became a specialty with him. Nine years of this experience fitted him for a call to the chair of chemistry in Western Reserve College, then in Hudson, O., with which institution he has since remained, although it is now located in Cleveland, and forms part of the Western Reserve University. In 1873 he was given the chair of chemistry in the Cleveland Medical College, and that place he has likewise since continued to fill.

As a collaborator with Albert A. Michelson, now of the University of Chicago, in 1884, he repeated the experiment of Fizeau on the effect of the motion of a

EDWARD WILLIAMS MORLEY.

transparent medium on the velocity of light, which they followed with experiments conducted with a view of testing Fresnel's explanation of astronomical aberration. This led to the determination of a practical method of comparing the wave length of sodium light more accurately than had hitherto been done, also of a method of laying down on a bar of metal a desired number of such wave lengths with an accuracy greater than that of a micrometric comparison of standards of length, so that the sodium wave length may be made a natural standard of length.

It was prior to this work that Morley had begun to study the cause of the variation of the amount of oxygen in the air, and after designing special apparatus for his purposes, he made many analyses of the atmosphere. His results showed that the accepted theory by Jolly of the causes of the variation of the amount of oxygen in the air was untenable, and he indicated that air at an elevation above the earth's surface was poor in oxygen, and that when such air was brought down to the surface by currents it was deficient in oxygen.

Notwithstanding the fact that Berzelius, Dulong, Dumas, Stas and others had apparently exhausted the subject, he set for himself the task of a redetermination of the atomic weight of oxygen. His intention was to secure values of the atomic weight of oxygen by different processes and to continue until the results would agree sufficiently close. He obtained one value from the ratio of the densities combined with the ratio of the combining volumes and a second value from the weights of oxygen and hydrogen, which he caused to unite to form water; and a third value was obtained from the weight of the hydrogen and the weight of the water that is formed from it. There was no balance in this country delicate enough for him to weigh on, and the authorities of the Smithsonian Institution had one built for him in Holland.

An abstract of some parts of his work appeared in the American Chemical Journal for April, 1895. The entire work has been prepared for the quarto Contributions of the Smithsonian Institution, and is now in press.

Mushroom Spawn.

The general public, and even a good many gardeners, have but misty ideas as to the mode of growth of mushrooms. If this is true with reference to the mushrooms, it is even more so in regard to the spawn. Those who do know are not always successful in the "manufacture" of spawn, and sometimes experience disappointment in the growth of that purchased. The gardener has frequently to encounter two evils in mushroom growing, one uncertainty of production, which may arise from bad or dead spawn, but is usually the result of want of care in regulating the temperature of the bed before or during spawning; the other the production of mushrooms, indeed, but of mushrooms intermixed with other fungi whose presence is not desirable, and might even be injurious. This evidently arises from the use of bad, that is of mixed, spawn. The "spawn" represents the roots, stem and branches of a flowering plant, and it feeds upon decaying animal and vegetable matter, being, in fact, what botanists call a "saprophyte," and not a "parasite" on living plants. When this spawn is placed under suitable conditions of moisture and heat, it absorbs food, grows, spreads, and ultimately sends up into the light and air the stalked caps which represent the fruit or seed vessel of an ordinary plant.

The would-be "manufacturer" would do well to visit a botanical laboratory where fungus "cultures" are undertaken, so that he might be able to see and realize what are the conditions under which fungi can be grown. "Culture" in a laboratory and culture for market, though dependent on identical principles, are necessarily different in detail. A French botanist, for instance, has succeeded in growing mushrooms on glass plates with the aid of certain chemical solutions, and without the aid of any manure whatever, the temperature being kept uniform. The advantages of such a procedure in cleanliness, certitude as to the species employed, and regularity of production, would of course be great. At present, however, this is only a laboratory experiment, and as such presents nothing remarkable to the student of fungi. Whether such procedures can be taken on commercial lines is another matter, and one that might well be investigated at Chiswick or some other experimental garden. In the meanwhile, we must go on in the old ways, and get the best spawn we can. The "manufacture" of mushroom spawn may be looked on as a curious and out of the way sort of industry; but it is a very important one nevertheless, as those who pay a visit to Mr. Johnson's farm at Hanger Hill, near Ealing, may see for themselves.

Mr. Johnson, we may say, from such an inspection of his land and his crops as a daily journey through them for some years past has enabled us to make, is an excellent farmer, and one who apparently does not approve of grumbling and despair as remedies for agricultural depression. Among other things he has a herd of 100 or more cows and these repay the attention bestowed upon them, not only by the milk they yield, but by the aid they afford in the production of virgin spawn. In Mr. Johnson's spawn factory the bricks have the form of flat tiles 9 inches by 4½ inches. They appear to consist of fine loam mixed with cow manure and with fragments of spawn interspersed. When mixed, they are spread on the ground in the open air to dry, and then placed on racks in open sheds. There is so large a demand for this spawn that some difficulty is occasionally felt in coping with it.

Mr. Johnson tests the value of his spawn by himself growing mushrooms on a large scale. Long raised mounds of manure are formed in the open air, each 32 yards in length and 2 feet 6 inches in height, and as much through at the base. The degrees of fermentation and heat are, of course, watched, and when the heat has decreased, say to 80—90°, and remains pretty uniform, the beds are "spawned" by the insertion at intervals of fragments of the bricks 3 inches square. The beds are moistened when necessary, and when the spawn has commenced to run, the beds are then cased with mould about 1½ or 2 inches thick, and then covered with long litter, beneath which, in about six weeks, the fungi make their appearance. On the average, we were told, these beds have produced 19 lb. of mushrooms to the yard. The average price for the year has been 8d. per lb., or 12s. 8d. a yard. Four outdoor beds spawned in September last came into bearing a month later, and produced upward of 2,000 lb. weight of mushrooms by November, some being of extraordinary size. The weekly average gathering is upward of 700 lb. The beds are arranged so as to insure a more or less continuous supply, one set succeeding another.—The Gardeners' Chronicle.

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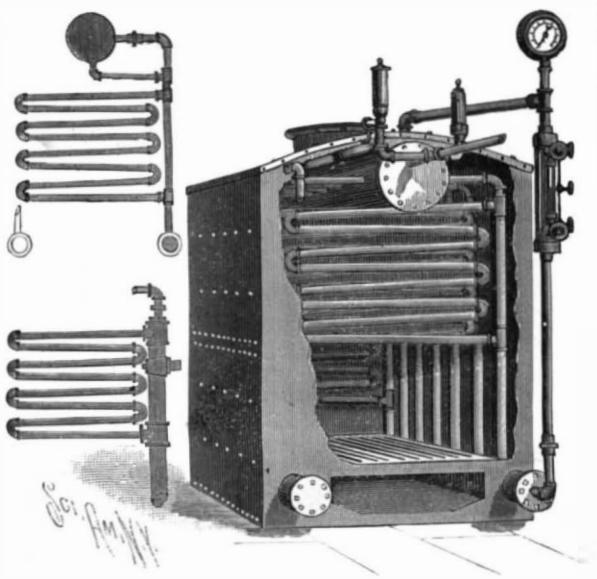
AN IMPROVED SECTIONAL BOILER.

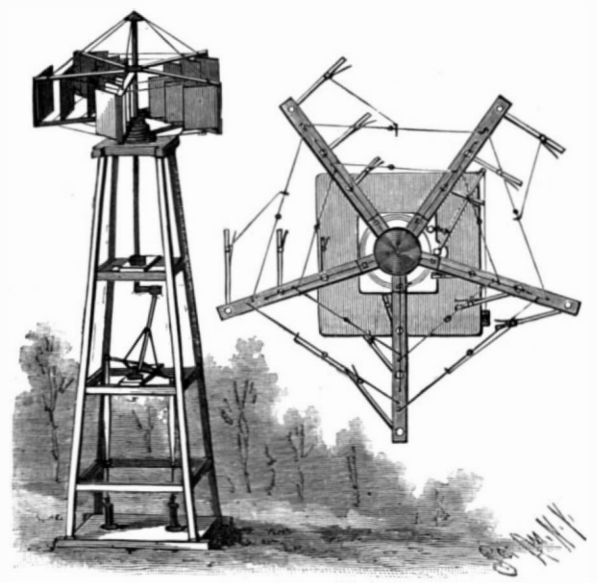
The illustration represents a boiler designed to utilize fuel to the fullest advantage in heating water and generating steam, the construction being at the same time simple and durable. It has been patented by Theodore H. Wyman, of Sebec, Me. The grate is supported on the mud drums, which are connected with each other by a pipe at the rear, and from the mud drums side pipes extend up to the steam drum, the side pipes being connected with coils whose lower runs form the top of the fire box, the side pipes forming its sides. The rearmost coil for the end side pipe forms a back for the fire box. Drain pipes lead from the steam drum to a side pipe on each side, and in front of the drum is a pipe to convey the steam to the point of use, a safety valve and whistle of the usual construction being provided. One of the small figures represents one of the side pipes and one of the coils, the steam drum and the mud drums, another figure showing a modified form of side pipe. The top of the steam drum is also connected with a vertical pipe having a steam gage and a water gage, the pipe connecting at its lower end with a mud drum. The feed water is heated before entering the boiler by being passed through a coil on top of the boiler and extending over the steam drum.



WYMAN'S SECTIONAL BOILER.

AN EFFICIENT WIND MOTOR.

The illustration represents a motor having a wheel designed to utilize the full force of the wind, and having nicely feathering blades or fans, simple means being also provided for transmitting the power to one or two pumps or other mechanism. The improvement has been patented by Mr. Richard Lundqvist, of Laguna de Terminos, Mexico. The main view represents the motor operating two pumps, the other figure being a plan view of the wind wheel. Extending from the two hubs of the wheel are U-shaped frames, each of which supports a series of fans pivoted at one edge, the movement of the fans being limited by stops which engage jointed cross braces. Each fan has also on its back a spring preventing excessive shock when the fan is suddenly forced inward, and the outward movement of the outer fans is limited by links pivoted to the upper stops, the links having eyes which slide on the braces, so that when the fans are moved inward the links slide parallel with the braces; but when the fans move outward the links extend at an angle to the braces. The main shaft terminates at the top in a cap, from which extend braces connecting with the several frames, the shaft being mounted in a ball bearing. The shaft extends through a top plate of the tower, in which is a bearing ring encircling the shaft with bearing rollers, preventing lateral movement of the shaft but permitting it to run very easily. On the under side of the wheel is an annular flange, around which extends a strap brake normally held in engagement with the flange, but by pulling on a downwardly extending cord connected with the brake lever the strap is drawn away from the flange to start the wheel. The lower end of the main shaft carries a crank actuating an inclined rock shaft connected with a yoke, from whose opposite ends project arms which are pivotally connected to upright connecting rods pivoted at their lower ends to the pump rods. As each wing has three metal sheets or fans resting on pivots having but a small motion, and changing their position as the wheel goes round, it is designed that the wheel will at all times attain the highest possible efficiency, the motion of the wheel normally regulating itself with the changing position of the fans.



LUNDQVIST'S WIND MOTOR.

Paints for Iron.

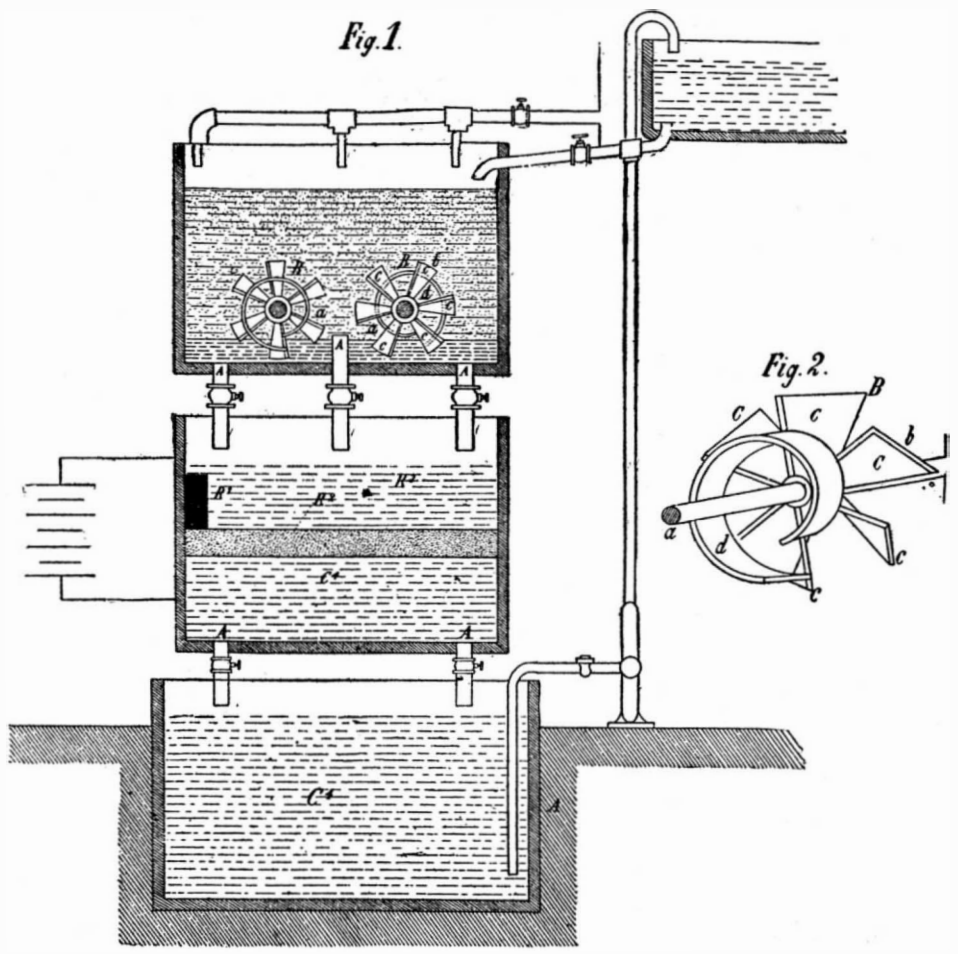
The tar obtained in the manufacture of oil gas is subjected to fractional distillation up to the temperature of 250° C., when about 11·35 per cent will have distilled over. The remaining 88·65 per cent forms a glossy black mass, having the consistency of honey and a specific gravity greater than that of water. It is dissolved by the aid of heat in about half its weight of volatile hydrocarbons, such as benzine and the like, and a paint is thus obtained which dries very rapidly, adheres well, and does not crack or fall off. It will penetrate through iron rust and prevent further oxidation of the iron. Manganese or lead driers may be added if desired.—H. and B. Kolker and H. Naphtali, Breslau, Prussia.

NEW PROCESS FOR TREATING ORES.

We give an engraving of the apparatus and subjoin a description of the process for treating auriferous and argentiferous ores invented by Mr. Eloy Noriega, of Apartado 516, city of Mexico, Mexico.

In the apparatus three tanks are arranged, one above the other. The upper tank, which is of suitable size and shape to receive the amount of ore to be treated, is provided with two shafts which extend through the walls of the tank and carry agitators, B. These agitators are alike, but oppositely arranged with respect to each other. Each consists of a screw propeller, having wings, c, and a plate, d, arranged in the form of a volute and secured to the side of the screw, as shown in Fig. 2. The upper tank is provided with tubes through which the material to be treated and the reagents are introduced. The agitators are driven by connection with any suitable motive power. After the agitators are stopped, the mass is allowed to settle, when the material acted upon is drawn off into the second tank, where it is subjected to electrolytic action, the second tank being provided with a horizontal carbon partition. The liquid percolating through the carbon partition is drawn off into the lower tank, from which it is returned to the supply tank. The ores are treated by cyanide of potassium, soda, mercury, and ammonia, after being subjected to a preparatory treatment with potash, lime, or alkaline clays, which can be incorporated with the ore or its compounds, when desired, or can be washed out if desirable, when the alkalies are soluble in water. The treatment with the cyanides takes place in the tank provided with the agitators. In some cases the cyanide solutions are filtered through the ores themselves and form solutions of the precious metals contained by the ores.

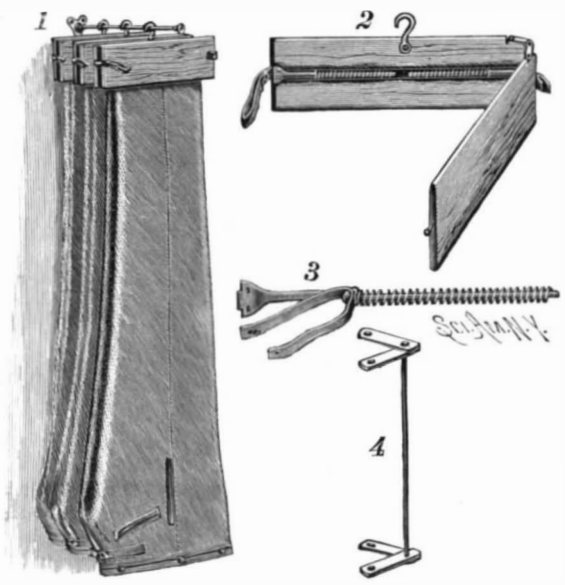
After the ores have been treated by the cyanides, they are treated electrolytically in the second tank. After the solution is treated electrolytically, it is passed through a zinc strainer, or a body of finely divided zinc, to remove the last traces of precious metals.



NORIEGA'S NEW PROCESS FOR TREATING ORES.

A TROUSERS HANGER AND PRESS.

The illustration represents a device by means of which, with but very slight attention, trousers may be kept to look new and bagging at the knees be prevented. It is manufactured by the Practical Novelty Company, No. 425 Walnut Street, Philadelphia, Pa. Fig. 1 shows the manner in which the trousers are suspended by the hanger, and also illustrates a convenient method of hanging a number of garments, made possible by its use. Fig. 2 shows the hanger opened, but with the central portion of one of its leaves broken away to show the concealed coiled springs around rods sliding laterally to and from each end, by means of which pressure is applied to the bottom portions of the garment. Fig. 3 shows one of these spring rods removed, and Fig. 4 shows the hinge, which freely and automatically allows for different thicknesses of cloth, as the hinge permits a separation of the leaves of nearly 1½ inches.



The separation of the leaves by the introduction of the garment between them automatically puts the spring at the hinge end under compression, as the outer end of the rod on which the spring is located is permanently connected by a strap to the upper leaf. On the outer end of the other spring-pressed rod is also a strap with an eye adapted to engage a pin on the free end of the upper leaf, this spring being also put under compression as the strap is pulled out to make locking engagement with the upper leaf when the folded lower ends of the trousers are placed in the device. A pressure is thus exerted upon the goods which takes out any wrinkles or folds there may be across the bottom, while the weight of the garments, hung as shown in the illustration, corrects the effects of wear without destroying the elasticity of the cloth.

PAPIER mache is a new material used in constructing bicycles, and it seems they stand the wear and tear of heavy road work very well.

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MANUFACTURE OF MARBLEIZED SLATE MANTELS.

The slate used for marbleized mantels comes principally from the quarries in Pennsylvania and Vermont. The material is shipped to the mantel manufacturer in slabs, brackets, etc., already cut into the proper shapes and sizes. The material costs from 12 to 16 cents per running foot, the slabs ranging in size from 2 to 7 feet in length, 1½ to 18 inches in width and from 1 to 1½ inches in thickness. The materials used in the manufacture of these mantels are oil paint, water color paint, varnish, gold leaf and bronze, the paint, after being applied, passing through a baking and rubbing process which hardens and polishes the material. The different parts of the mantels, which are composed of shelves, pilasters, friezes, profiles, brackets, columns and wall plates, are fitted to each other when finished by means of angle irons, bolts and screws. The first operation is the cutting and carving out of scrolls and spaces for panels. This is performed by means of mallet and chisels, the operator first drawing out the design and then passing the steel tools over the lines, cutting and carving them out the proper width and depth. After the carving operation the slabs are then taken and rubbed with Ohio sandstone. This stone comes in chunks and is soft and gray colored. A quantity of the stone is first broken up into a fine powder and sprinkled on the face of the slabs, the operator then taking a chunk of the material and rubbing it over the surface for from ten to twenty minutes, which takes off the grit and rough places, giving it a fine surface for the next operation. After rubbing, the face of the slab is then given a coat of varnish paint. This paint is the groundwork and is principally in two colors, red or black. The paint is ground and mixed with a quick-drying varnish, which holds the color on the slabs. After the slabs have received a coat of this paint, they are placed on end in the open air and left to dry, which takes about 15 minutes. The slabs are then ready for the dipping operation. This is performed in a large wooden tub or vat, about 10 feet in length, about 6 feet in width and about 3 feet in height, containing about 520 gallons of water. Two sticks are first wedged a foot or so apart across the tub on the surface of the water, the operator then, by means of a flat brush, sprinkling the water between the sticks with a number of different oil colors, such as black, white, blue, etc. As soon as the colors strike the water they mingle freely with each other, spreading out into different colored veins, giving the surface of the water the appearance of marble. The operator then takes the slab and sinks or dips it face down into the floating oil colors, which instantly adhere to the varnished surface. It is then withdrawn and placed into a baking kiln. If the slab is to be paneled with another color, the marbling or oil color is wiped off where the panel is lined out before being placed in the kiln.

The kiln is about 10 by 10 feet square, and lined with tin. About 400 feet of the marbled slabs are placed a few inches apart in iron frames, connected to the sides of the kiln and baked for from ten to twelve hours in a temperature of about 160° F. A coal fire is best for baking it, hardening the material better than steam. Paneling is done with water color paint in different styles, some of which are the Tennessee panel, onyx, and the gray granite panel. The colors are mixed with water and a little sizing. In making the Tennessee panel, the surface, which was wiped off before the baking operation, is first given a coat of Indian red, over the top of which, before drying, the operator puts a coat of French zinc white. A sponge is then tapped lightly on the painted surface, which lifts the white color from the other and, at the same time, partly mixing them, giving the panel a beautiful mottled appearance. In making an onyx panel a coat of French zinc white is first put on for the groundwork, the operator then, with a camel's hair pencil, draws in the streaks of different colors with Indian red, raw umber, and raw sienna, imitating the colors of genuine onyx. After the panels are finished they are allowed to dry about from ten to fifteen minutes. They are then sized with a solution of turpentine and slow-drying varnish, the solution being put on lightly with a camel's hair brush. After sizing, they are allowed to set for about two hours, after which they are revarnished with a bristle brush. The operator then places them into the iron frame or rack in the kiln, and they are rebaked for twelve hours more. When the second baking operation has been performed, they are taken out and scoured with lump and pulverized pumice stone, soap being first rubbed on the surface to keep the paint from gumming. After scouring they are revarnished again and put back into the kiln for a third baking for twelve hours, after which the gold leaf and liquid bronze is put into the lines with a brush around the panels and scrolls, and the marbled slabs fine rubbed with felt and bolted pumice stone. The fine rubbing tends to soften the varnish, making it necessary to bake the slabs for a fourth time for twelve hours, after which they are rubbed again with rotten stone and felt, and then polished by the palm of the hand. Eight hands can turn out about 600 running feet of marbleized slate weekly. The sketches were taken from the plant of J. Dickson & Brother, Jersey City, N. J.

THE MARBLEIZED SLATE INDUSTRY.

The Niagara Falls Plant in Operation.

After almost five years of work and the expenditure of over $3,000,000, Niagara Falls are now being utilized for power. The monster 5,000 horse power dynamos of the Cataract Construction Company are now sending out electricity for commercial use. The first power was delivered to the works of the Pittsburg Reduction Company at 7:30 o'clock, August 26, when dynamo No. 2 in the construction company's power house was set in motion. At the reduction company's works there were about a dozen men at work, and the pots used in the making of aluminum are being tested by them.

The power from the power house is sent over copper cables laid in a conduit to the aluminum works. The current sent out is an alternating one, and before it can be used in the making of aluminum it must be transformed to a direct current. This is done by passing through four of the largest rotary transformers ever built. These are 2,100 horse power each, and three of them are running.

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THE CREUSOT DISAPPEARING TURRET.

Since the epoch at which torpedo shells were brought into service, the use of metallic armoring has assumed great importance in the art of constructing permanent works. It is now usual to say that armored fortifications are the defenses of the future.

In this order of ideas, and following progress step by step, we have already made known in these pages the various types of cupolas. We now propose to describe another one that has just made its appearance. We refer to the Creusot disappearing turret for a 57 mm. gun of the Hotchkiss type.

The body of this small turret consists of a steel plate cylinder of 1·4 m. internal diameter capped with an armored cupola. Made in a single piece of cast steel, the armoring has the form of a capsule whose vertical wall has the shape of a ring, and the bottom the form of a spherical calotte. The ring, which has an external diameter of 1·62 m., is 10 cm. in thickness. The cupola projects slightly over the armor facing of the wall so as to form an epaulment, which, at the moment of the disappearance, enters a channel formed in the edge of the lip of the glacis plate. This latter, which is composed of two segments of hard cast iron, has a profile that may be inscribed in a square of one meter section. It measures 240 mm. in thickness at the lips and 550 at its foot. The joints of the sections are reenforced in the interior by ribs that are rendered as tight as possible by bolts. The movable armor is provided with five apertures: In front the gun port, with a sight hole; at the pole, an aperture of about 8 cm., to allow of the passage of the tube of an observation telescope, and in times of rest closed by a bronze plug; and behind and upon the sides with three sight holes 4 cm. in diameter that permit of a survey of the field during the operation of firing.

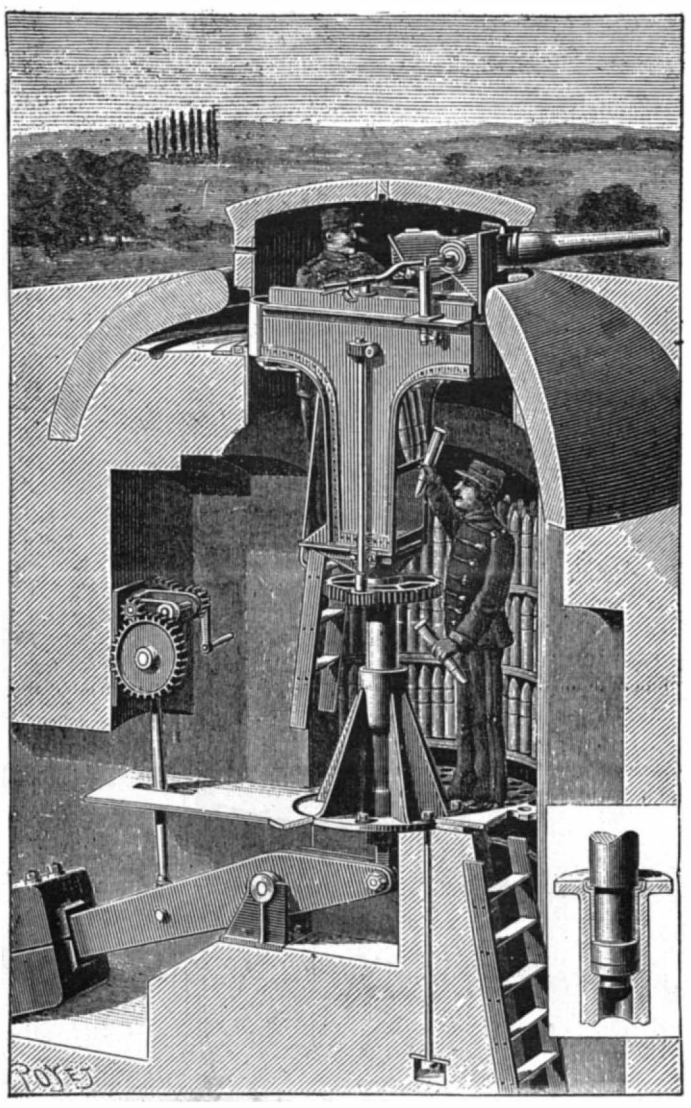
The disappearance is effected in two seconds by means of the labor of one man turning a crank. The same is the case with the lifting of the apparatus, the travel of which in each direction is 31 cm. This facility of motion results from the happy arrangement of a jointed connecting rod beneath the pivot step, and through the intermedium of which the entire movement of the turret rests upon the end of a working beam whose other extremity is loaded with a cast iron balance weight.

The body of the turret is supported by two plate and angle iron cheeks connected at their lower part by a cast steel cross piece into which is set the pivot. The latter rests and revolves upon a bronze step supported by a steel block which rises and descends under the action of the disappearing apparatus.

The gun is capable of occupying two positions in succession in the turret. After the latter has disappeared the gun has entirely entered the interior, while, when the turret is raised, the gun's muzzle projects externally so as to allow the gunner the space necessary for him. The upper part of the cheeks serves as a roller path for the carriage, while their lower part constitutes a maneuvering platform.

The amplitude of pointing in direction is 360°, and that of upward pointing has for limits 5° below and 10° above the horizon. The 57 mm. rapid fire Hotchkiss gun throws, at an initial velocity of 425 meters, an ordinary shell or a canister shot weighing 2·72 kilogrammes.

The service of the turret requires but two men—one having in charge the pointing, the maneuvering and the firing of the gun, and the other having in charge the ammunition and the maneuvering of the disappearing apparatus. The use of small disappearing turrets armed with light rapid fire pieces is of high importance in the defense of places. This was a principle that the Roumanian government could not disregard, and so it has had constructed at Creusot a hundred and twenty-six armored turrets conformable to the type that we have just briefly described, and the majority of which are at the present moment armed and in place in the fortification works of Bucharest.—La Nature.



DISAPPEARING TURRET FOR A HOTCHKISS RAPID FIRE GUN.

Plant Trees.

We concur with a writer in one of our exchanges who says:

Farmers throughout the United States are making a mistake when they fail to plant trees on all their land not suited to crops, and along their lanes, fences, and highways. Without any other expense than that of planting the young trees they could provide for fine rows of maple, oak, pine, birch, hickory, walnut, and other trees on their farms, all of which would be increasing in value every year. Again, they might plant fruit trees and thus secure abundance of cherries, peaches, apples, plums, and other fruits. In some of the older parts of New Jersey and Pennsylvania the farms are crossed, recrossed, and bounded by rows of cherry and other fruit trees, and the owners look upon these trees as remunerative and almost indispensable.

Weight per Square Inch on Car Journals.

In reply to some questions on permissible weight on railway wagon axles, Mr. E. W. Grieves has written at length to the Railroad Car Journal, from which we take the following:

(1) "In figuring number of pounds per square inch on a car journal we use as a basis the actual bearing surface and not the area of the journal. From inspection of the different brasses I find that the bearing surface of a brass seldom, if ever, increases with the wear after the brass has once become fairly seated."

(2) "Our heaviest regular freight car weighs 32,300 pounds, including trucks, and is permitted to carry a maximum lading of 66,000 pounds, of which 6,000 pounds is the permissible excess load. Our journals are 4 inches diameter by 8 inches long. We do not, however, consider it safe to take the projected area of these dimensions as the bearing surface, and as a basis on which to figure the load per square inch of a journal surface, for the reason that, when new, the actual projected area is very much less, and it is clearly the minimum projected area which is most dangerous. The projected surface on the brass is 7½ inches long by $3\frac{7}{16}$ inches wide, giving the area, approximately, 25½ square inches. The wheels and axles weigh very nearly 6,300 pounds. The actual weight coming upon the journal is, therefore, 92,000 pounds, or 11,500 pounds upon each journal, which, divided by the projected area of each brass, gives the maximum load per square inch of bearing surface a little less than 451 pounds. It is true that as the brass wears, the journal embeds itself deeper into it, but the length of the brass is diminished in the course of time by end wear, which may or may not compensate for the increased width of the bearing. Again, the journal becomes reduced in diameter, and in the latter stages of its existence before it is removed, it may be down to very nearly 3¾ inches, and the brass may again be worn to a considerable amount at the ends. The safe measurement is, therefore, I think, that obtained from measuring the projection of the surfaces in contact when the brass and axle are new."

(3) "The weight of our heaviest cars, when loaded to their full capacity—which are our 60,000 pounds capacity furniture cars—is 335 pounds to the square inch on the axle. Our 60,000 pounds capacity box cars carry 320 pounds to the square inch. We arrived at the weight in the same manner that you do. We are having very little trouble with these cars."

(4) "The maximum load on our car journal is, with our 30 ton loaded car, when we have 90,000 pounds on eight journals, each having a bearing surface of $7\frac{5}{8} \times 4 = 30$ square inches. $\frac{90,000}{8 \times 30} = 375$ pounds per square inch. We think 4 inches wide is ample to count on, as but little pressure comes on the side when the bearing is badly worn."

The Chicago Bird Hospital.

Among its many admirable institutions for the care of the sick and disabled, Chicago enjoys the distinction of possessing a bird hospital, the only one of its kind, it is claimed, in the United States. This unique establishment has never been beneficiary of an endowment either by the State or at the hands of individuals, yet its manager, C. A. Cross, seems to be able to make the financial ends of the institution at least meet, if they do not overlap to any great extent.

It is only necessary to watch Mr. Cross for a few moments moving about among his feathered friends to realize that his heart is in his business. While his work brings a living to himself and wife, it also brings restored health to many a little winged sufferer, and this phase of his life work apparently affords the bird doctor quite as much satisfaction as the other. His wife, however, seems equally interested and absorbed in the novel business, and he modestly attributes much of the success of the "institution" to her delicate care of the indisposed inmates. The birds, too, seem to understand all this, and evince their appreciation by signs, and sometimes utterances, which show how deeply they appreciate the kind offices of their physicians.

According to Mr. Cross, birds are subject to nearly all the ailments which infect humanity. The parrot particularly, which may be considered the autocrat of the feathered tribe, leads all birddom in the number and variety of diseases to which it is subject. Pneumonia, catarrh, consumption, diphtheria, tonsillitis, and a wide range of other throat troubles are among the common ailments of this popular pet. Even gout among the more highly favored in the matter of ownership is not uncommon among these the upper ten of birddom.

Mr. Cross explains that the most fruitful sources of disease among parrots are improper food and carelessness on the part of their owners in leaving doors and windows open while the birds are moulting, so that they then contract colds. Improper food results in stomach troubles, frequently catarrh of the stomach. This is brought on most frequently by feeding the birds potatoes and other greasy food. In the case of Charley, the Colorado parrot, his distemper was brought on by eating meat and greasy food from his owner's table. The moulting season is the dangerous time for all captive birds, and as this is the parrot's season for shedding his feathers, sick birds of that species now predominate at the hospital.

Mocking-birds and canaries moult later, in the early fall, and Mr. Cross says he always has his hands pretty full with these little singers during that season. Though he does not get as much for taking care of the smaller birds, they are really more trouble, as they are not so easily handled as the parrots and have less intelligence to aid in pulling them around.—Chicago Times-Herald.

Labor Saving Machinery.

The Detroit Free Press says: "It is well known how ingenious machinery has well-nigh revolutionized the once intricate work of the carpenter, leaving only the simplest part of the trade for manual labor. Never was this innovation of patented devices more marked than between 1880 and 1890, yet there were 53,547 carpenters in the United States in the former year, while there were 140,621 in 1890, and the average wages of the latter were $675 as against $450 for those who had far less machinery to contend with. Between the same years great strides were made in the moulding and handling of brick by machinery, yet the number of workmen doubled while the number of yards was but slightly increased, and the wages advanced from an annual average of $228 to $300. In few industries has the saving of labor by machinery been more marked than in the manufacture of furniture, and the cheapening of the product has been simply amazing; yet the number of men employed in it increased from 55,304 in 1880 to 92,304 in 1890, wages advancing from an average of $453 to $527. This line of evidence might be pursued throughout the list of industries where, for any considerable time, machinery has been doing the work of brains and hands. The conclusion forced is that the introduction of labor-saving machinery is not to reduce permanently the number of employes, but simply to readjust the working force and insure higher wages."

An Electric Flag.

It is stated that an electrical novelty in the shape of a standard intended for night use has just been delivered from the Kiel dockyard to the German imperial yacht Hohenzollern. The flag is four meters square, and the design is traced in colored electric lamps, which are lighted by a wire from the deck. An experimental illumination proved very successful, and gave the utmost satisfaction to the spectators.

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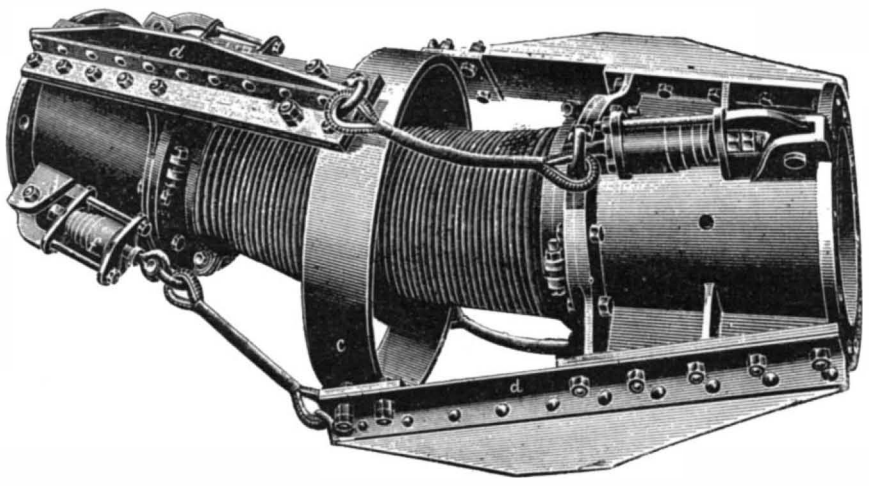
DREDGING AND FLOATING PIPE SYSTEM.

During the construction of the North Sea Canal it was necessary to employ a large number of dredgers, and to find means for the deposit and disposal of the spoil. In some cases, where the land was low and covered with shallow water, it was not practical to employ barges to carry away the dredged material. Resort was therefore had to floating pipes, with flexible joints; through these pipes the raised sand was carried a mile or so from the dredge. Engineering says: Some of these peculiar dredgers, for which we cannot find any better name than the term "press" dredgers, by which they are known on the canal, were still at work some weeks before the inauguration of the canal and may be doing duty yet. These 16 inch pipes have been applied in lengths of three-fourths mile. In calm weather, and as long as the banks were as level as in the illustration, the pipe system did not cause much bother, unless a stoppage occurred somewhere—an awkard but not too rare event. When the wind was blowing, the pipes had to be coiled round the dredger and held in other ways. To impart the necessary flexibility to the pipe system, and also to render the sections accessible, the universal joints, of which we give a perspective view, were inserted about every 25 yards. The device offers the advantage of a ball and socket joint, which itself would have been unsuitable. The two pipes are connected by tubular sections and a piece of hose, which is held by the arms, d, fixed on the one side to the pipe connection and on the other to the ring, c, through which the hose passes loose. From the ring terminals wire rope cords stretch over to the other side, where they are connected to spiral springs, f. These arms and cords limit the twisting of the hose, without interfering with the flexibility of the joint. The elastic part is exposed to considerable wear, which leather, otherwise preferable, does not stand so well as rubber. When we saw these dredgers, of which five have been employed on operations in May, the dams which they were creating had attained such a height that the pumps had to force the spoil 18 feet high over the banks, behind which the mud was being deposited. Stoppages were naturally most likely to occur in these rises. When everything went well, the spoil passed with a velocity of from 10 feet to 16 feet per second through the floating pipes. Up to

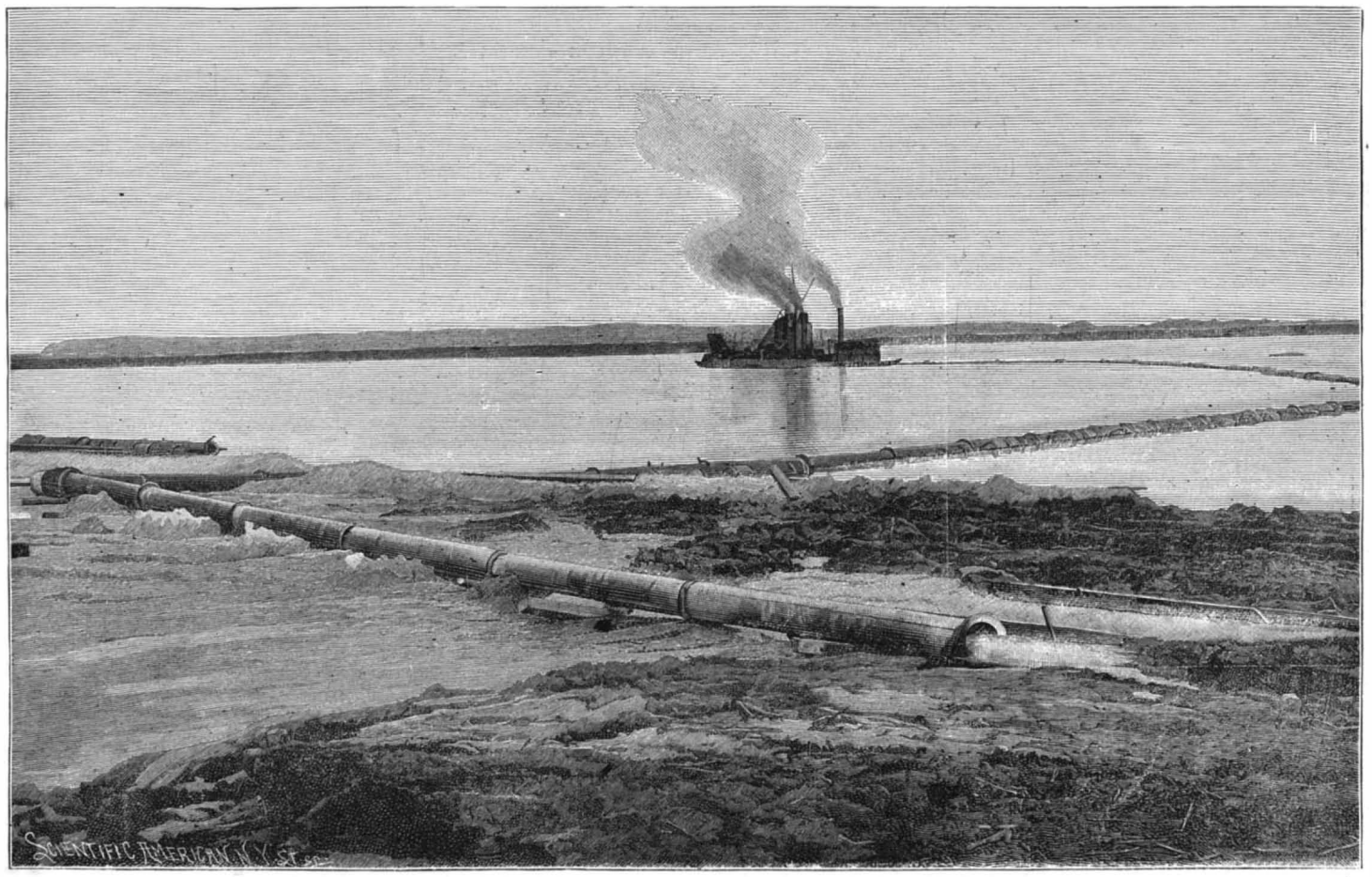


FLEXIBLE FLOATING PIPE CONNECTION.

2,600 cubic yards of soil are said to have been dredged in this way in 24 hours.

A similar method of conducting the dredged material is now at work near the margin of Jamaica Bay near Brooklyn, N. Y., at a place known as Bergen Beach. Here it was necessary to deepen the water in front of the property and also to fill the front out to deep water.

To carry out this work the contractors built one of the largest dredging machines ever constructed. This dredge makes the channels in the usual way, but instead of dumping the sand into scows, it throws it into a hopper, where, by compressed steam, it is sent through immense pipes and emptied upon the land. In some cases the material is forced through pipes nearly a mile long. It is curious to see the sand pouring out on the ground and to realize that it comes from the dredge far out in the bay. A remarkable fact is that in every part of Jamaica Bay where the dredge has been at work there has been found only the finest sand, not a single stone or rock having been struck. It is hard to believe while walking on the solid ground and fine beach on the completed portion of the work that less than a year ago it was marsh land, such as is seen now at Sheepshead Bay and other shore resorts. The contract for this work amounts to over $200,000.



DREDGER WITH FLOATING PIPE SYSTEM.

Bicycle Patents.

Bicycles and their attachments have formed the subject of so many patents, and the interest in them is participated in by people of such diversified attainments, that a complete summary of everything pertaining to them which has passed through the Patent Office is valuable from more than a professional standpoint.

Such information has been compiled and arranged in a way to be conveniently accessible by Examiner James T. Allen, of the United States Patent Office. It is presented in two volumes, of 454 and 1,049 pages respectively, entitled "Digest of Cycles or Velocipedes with Attachments, patented in the United States from 1789 to 1892." The work gives the full claims and complete drawings, and has a carefully prepared index. It is the only publication of the kind ever issued, and cannot fail to prove exceedingly valuable to all lawyers and others interested in the prosecution of Patent Office work in this direction, as well as to manufacturers of wheels and bicycle sundries, which has now become quite an extensive industry. The work was published by authority of the Commissioner of Patents, and only a limited edition was issued. The same subject matter has since constituted the contents of a serial publication, now issued quarterly. It presents the number, name and date of all patents in this line, together with lists of references cited in the examination of applications, interferences and the parties to them, etc. Further information can be obtained by addressing Mr. Allen, as above.

Waterproofing Bricks and Sandstone.

At a recent meeting of the Australian Association for the Advancement of Science, Professor Liversidge read a paper on the "Waterproofing of Brick and Sandstone with Oils." Experiments were made with the view of ascertaining the length of time that brick and sandstone are rendered waterproof or protected by oil. The oils used were the three commonest and most readily obtainable for such purposes, viz., linseed oil, boiled linseed and the crude mineral oil known as "blue oil," used for preserving timber. The weatherings were made upon a flat portion of the laboratory roof, fairly exposed to the sun and weather. Good, sound, machine-made bricks were experimented on. The amount of oil and water taken up by the sandstone was very much less than that absorbed by the brick, although the area of the sandstone cubes was much greater than that exposed by the bricks. Equal amounts of raw and boiled oils were absorbed; the blue oil, however, was taken up in much greater quantity by both brick and sandstone, but by the end of 12 months the whole of the 13¼ ounces of blue oil had apparently evaporated away, and the brick had returned to its original weight. The bricks treated with raw and boiled oils remain unchanged. After the second oiling in November, 1890, and exposure for nearly four years and two months, they had practically retained all their oil, inasmuch as they had not lost weight, and were also nearly impervious to water. It was noticeable that the sandstone cubes treated with raw and boiled oils returned to their original weights, but do not appear to have lost the beneficial effects of the oils, being also practically waterproof.—Engineering and Mining Journal.

A Great Steamship.

The twin screw White Star steamship Georgic, Captain Smith, finished her maiden trip to this port, August 26. She is the biggest freighter in the world, and probably the swiftest, being able to make thirteen and a half knots an hour. She was built at Belfast by Harland & Wolff, and measures 10,077 tons. She is 538 feet long, of 60 feet beam, and 40 feet deep. When laden to her capacity she will draw about 28 feet. She can carry 15,000 tons of dead weight. She has tanks that will hold 4,896 tons of water. She can carry about 1,000 head of cattle on her two upper decks, and 3,800 quarters of beef in her refrigerated compartments. When the Georgic sails, she will take 12,000 tons of general merchandise, 900 live cattle, and 2,000 sheep.

EVERY animal kept by man, excepting the cat, is taxed in Austria.

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Maxim's Process for Solid Steel Guns.

Mr. Hiram S. Maxim, writing to the Engineer, London, says:

Fifteen or twenty years ago large forgings of steel were not always reliable; but, thanks to the recent improvements both in the process of melting and in the pressing of steel into shape by hydraulic pressure, it is now possible to obtain perfectly sound forgings of any size that may be required. In fact, I was informed by Messrs. Vickers, Sons & Company that they would guarantee to furnish a forging of a gun, all in one piece, weighing as much as 150 or 175 tons, provided it should be ordered of them, and they were willing to guarantee that every particle of the steel would be sound. It will be remembered that during the American civil war the American cast iron guns made on the Rodman plan were very much superior to those made in Europe; in fact, the Rodman guns, which were cast hollow and cooled from the inside, had every molecule of the metal pulling in the right direction. The inside of these guns was in a high state of compression and the outside in a state of tension. The consequence was that these cheap cast iron guns were quite equal to the wrought iron and steel guns which were made in Europe at the same time; and the fact that this was not altogether due to the superiority of the American cast iron is witnessed by the fact that two guns were made in the States, one cast solid in the same manner that English cast iron guns were made at that time, and the other cast hollow and cooled from the inside. They were both out of the same lot of metal, and it was found on firing that the gun made on the English plan showed signs of distress at the first discharge, and burst at the third discharge, while the American gun was fired 1,000 rounds without any sign of distress at all.

Believing that this same principle could be applied to steel guns, I erected a very large and expensive tempering plant at Erith. The first guns treated were 45 pounders, having a bore of 5·7 inches. The forgings were obtained from Messrs. Vickers, Sons & Company, of Sheffield, and were of a steel which had sufficient carbon to receive a spring temper. The forgings are first rough bored, and turned approximately into shape; they are then mounted in a furnace, and while rotating were heated to a dull red and allowed to cool slowly in the furnace. This process of annealing removed all the internal strains in the steel. The gun was then put in a lathe, turned down to very nearly the correct size on the outside, smooth bored, and rifled. It was then again mounted in the furnace in a vertical position, and while it was rotating in the furnace a current of coal gas was allowed to pass through the bore. The coal gas, of course, expelled all the air, and at the same time a small portion of the carbon contained in the coal gas was set free by the high temperature, and while in a nascent state combined with the interior of the gun, thus raising the quality of the steel and making it considerably harder.

When the gun was red hot the coal gas was shut off, and a very large stream of cold oil under a high pressure was forced through the bore with compressed air, while the gun was still revolving in the furnace. The result was that the inside was very quickly cooled without decomposing more than half a pint of oil, and the inside being cooled, the outside gradually shrunk upon it, so that when the gun was taken from the furnace it was found that the outside was in a very high state of tension, while the inside had been compressed about 0·02 of an inch. The careful treatment which the gun had received prevented it from bending; in fact, only a very slight deviation could be found in one of the guns, while another of the first two that were made was completely straight. In both cases the amount of distortion, so far as straightness is concerned, was extremely small. The guns were then lapped out until the bore was straight inside, it having shrunk more at the breech end than at the muzzle, and fired with increasing charges. With a short and rather small cartridge case, and a long and heavy projectile—45 pounds—a muzzle velocity of 2,200 feet was obtained, with a pressure of 15 tons to the square inch, but the proof charges were run up to 22½ tons per square inch.

One of the guns was not changed in the least by the firing, while the other was found to be 0·002 of an inch smaller at the breech end after the firing than before, showing that before firing the inside must have been in a very high state of compression, and the outside in a high state of tension, and that the enormous strain was sufficient when assisted by the shock of discharge to compress still more the inside layer of steel in the bore. This I think to be quite uncommon. I do not know of any authentic case where a gun fired at very high pressure has been found to be smaller after firing than before. As a rule, they all get larger by firing proof charges. Anyhow, the fact that the gun did get smaller shows that the strain set up by 22½ tons was not sufficient to put a permanent set into any portion of the gun.

I do not hesitate to say that these guns are the best that have ever been made, everything considered, and I do not hesitate to say that guns can be made on this plan which will be quite as reliable as they would be if they were made of innumerable pieces, one shrunk upon the other. This means that a gun may be made with half the weight of steel, half the time, and at half the expense as heretofore, and I do not see any reason why it should not be applied to the largest guns in the service.

Electric Railways in the United States.

According to an article in Scribner's Magazine, there are at the present time 850 electric railways in the United States, operating more than 9,000 miles of track, with 2,300 cars, and representing a capital investment of $400,000,000.

An idea of the rapidity and magnitude of the extension of this system of traction may be formed when the fact is noted that, in 1887, the electric roads in the United States numbered only thirteen, with about 100 cars in operation.

WATER PRACTICE OF THE "SUMMER PIONEERS" OF THE GERMAN ARMY.

We publish herewith some interesting engravings illustrating the practice of the so-called "Summer Pioneers" of the German army. It is a part of the duty of the pioneer battalions to instruct a certain number of officers and non-commissioned officers of the infantry regiments of their corps in field pioneer service. These infantry officers, who are expected to instruct the soldiers of their own regiment in the work later, are popularly called "Summer Pioneers."

CROSSING THE RIVER IN BOATS MADE OF BARRELS.

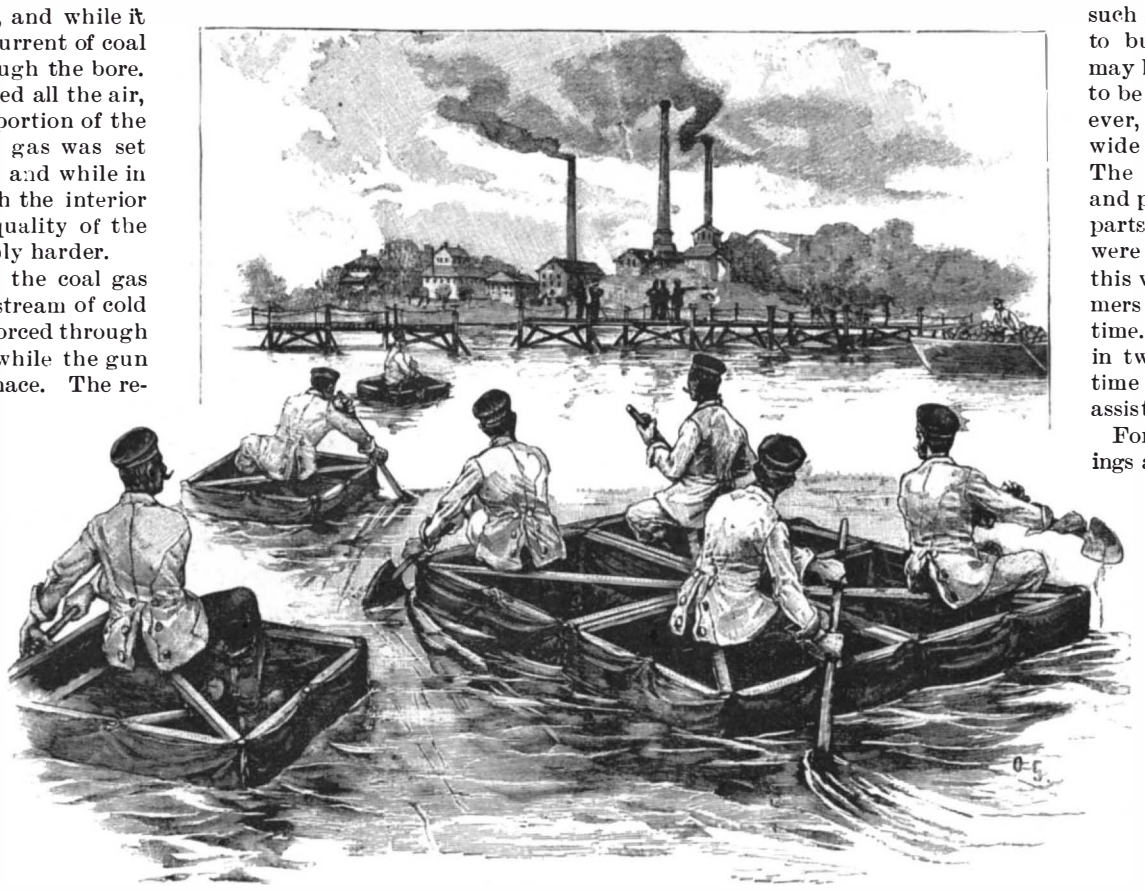
It is intended that all troops of the German army shall be able, even without the aid of pioneers, to cross a stream, and, therefore, a large part of the instruction given to the "Summer Pioneers" consists of building bridges, boats, etc. As the infantry troops are not provided with pontoons, etc., they are obliged to make use of any material that may present itself or be included in their equipment. Their tent canvases are most useful. When one of these pieces of canvas is filled with straw and the edges fastened together by means of the hooks and ears with which they are provided, it will support a grown man in the water, or can be utilized by a good swimmer to carry guns and ammunition. If several such sacks of straw are fastened together by means of poles and then the whole is covered with boards, they make an excellent float, which the soldiers can propel by using their little spades as oars, a rudder cut out of any suitable piece of wood being manipulated by one of the men.

Boats can also be made by nailing laths together in the form of an open box, over the sides and bottom of which the watertight canvas is secured, one cross lath serving as a seat and another as a support for the feet. A float made of such boxes fastened together has an astonishing carrying capacity.

Sometimes barrels can be found near a river that is to be crossed, and these are used as follows: A triangle is made of rough boards, a barrel is fastened in this triangle by means of straps, so as to form the seat of the boat while it keeps afloat, a cross piece is put in place for a foot support and oar locks are quickly made of laths. The pioneers call these boats "fleas."

But the "Summer Pioneers" do not devote all of their time to the construction of such devices; they are also taught to build bridges of material they may have, where small streams are to be crossed. This summer, however, an exception was made, as the wide Oberspree was to be spanned. The material was cut into beams and piles on the bank and certain parts were put together before they were placed in the water. In doing this work some of the good swimmers were in the water for a long time. The entire bridge was built in two hours—a wonderfully short time for amateurs, even if they were assisted by regular pioneers.

For the accompanying engravings and the above facts we are indebted to our worthy contemporary, the Illustrirte Zeitung.



CROSSING THE RIVER IN BOATS MADE OF TENT CANVAS.

The Simplicity of Clever Inventions.

The best way to become an author is to be born with a brain subject to flashes of inspiration that will supply you with first-class plots. But if you want to be an inventor you should work from the opposite standpoint. Find a crying need and seek to think out a means by which it may be met. Here is the fashion in which one man did this: Walking through a greenhouse one day, he noticed that the gardener was obliged to go to a good deal of trouble to raise each ventilating window separately.

"Why could not some arrangement be devised," this observant individual said to himself, "by which all these windows could be opened by one movement?"

He thought over the problem and contrived a model, and the result was the apparatus now in use in all conservatories.—The Argosy.

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Natural History Notes.

The Gulf Weed.—The remarkable alga known as gulf weed (Sargassum bacciferum) was first discovered by Columbus, and has for ages been floating up and down in midocean, occupying the position still that it did in the times of the earliest navigators. It is never fruitful except when attached to land within the area of the Sargasso Sea and the Gulf Stream, as at the Bermudas, yet it flourishes with vigor. The present geographical distribution is very strange. The sargasso plants are about the oldest of seaweeds, and seaweeds were among the first productions of vegetable life. At present sargassum occurs in vast floating beds in the warm waters of all the oceans, and, as the marine connections between the different localities are now closed to intercommunication by a barrier of icy water which it is impossible for the plant to pass, the distribution must have been effected previous to the beginning of the glacial period, which Mr. Croll puts at over 200,000 years ago. It is, therefore, thought probable that the Indian Ocean was the primary habitat of the gulf weed, and that the plant is a survival, in health and vigor, of the marine vegetation of a period as remote at least as the Miocene epoch. This theory of the intercommunication of oceans in equatorial latitudes during the Miocene period agrees with the views expressed by Mr. Alexander Agassiz.

A Wonderful Seaweed.—One of the most extraordinary seaweeds among the Laminariaceæ is the Nereocystis, the stem of which occasionally attains a length of 300 feet, though extremely slender, even at the top, where it is surmounted by a huge floating bladder six or seven feet in length that affords a favorite resting place to the sea otter. The account of this plant, which is found on the northeast coast of America and the opposite shore of Asia, is apparently so fabulous, as given by Mertens in an interesting paper on the botany of the Russian possessions in America, that it could scarcely be believed did it not depend upon unquestionable authority. The filiform stem, which is about as thick as pack thread, suddenly swells above, when two or three feet long, into a globose bladder, from the top of which springs a tuft of geminate leaves mostly rising on five petioles. These leaves are lanceolate and membranaceous, from one foot to two feet long and two inches broad in the center. As the plant grows older the stem increases enormously in length, but only slightly in thickness. The globose bladder swells into a turnip-shaped or retort-like cylinder, six feet long and four feet six inches or more in diameter in the widest part, the lower extremity gradually passing into the stem. The leaves, which at first were marked with a few faint nerves, split in the direction of the latter, cover a wide space by their entangled mass and attain a length of thirty feet or more. When the plant grows in any quantity it forms large floating islands and the surface of the sea becomes impassable to boats.

The stem, when dry, is employed by the Aleutians for fishing lines, some of which have a length of forty or more fathoms. The large bladders are used by the same people as siphons for pumping water out of their boats.

Parthenogenesis in Shrimps. — The crab-shield shrimp, Apus cancriformis, has no less than sixty pairs of feet, each made up of an almost incredible number of joints. A German naturalist of the last century, Schaeffer, counted the joints in one of these animals, and found them to number almost two million. Friederich Brauer, after studying the process of reproduction of these animals, finds that from the unfecundated eggs of the female there spring females only, while the fecundated eggs produce only males. The experiments on the reproduction of the females extended over three generations. He finds, also, that the male apus has one footless ring more than the female. With regard to parthenogenesis, or the production of offspring from unfecundated eggs, C. Vogt, in the course of an address before the Swiss Society of Natural Science, stated that he had observed it in another crustacean of the same order as the apus, namely, the brine shrimp, Artemia salina.

Secretions in Plants.—Mr. Tschirch announces in the Botanisches Centralblatt that in all the normal cases in which he has been able to study the formation of a secretion, he has found that it was a function, not of the protoplasm, but of the cellular wall. In the oil glands of the labiates, composites, etc., the secretion is due entirely to an internal layer of the cellular wall, and the same is the case with the Papilionaceæ. The secretions, however, are never produced by the metamorphosis of the substance of the cellulose itself.

The observation applies likewise to the resins, which Mr. Tschirch considers as aromatic acid compounds with a particular group of alcohols that he calls resinols.

Propagation of Alligators.—The attention of the United States Fish Commission has recently been called to a new and remarkable industry, that of the artificial propagation of alligators for supplying the trade in Florida curiosities. The incubator system employed is quite simple. The eggs, which are about the size of those of the goose, are placed in boxes of sand and covered up. The boxes are exposed on a roof to the torrid rays of a tropical sun, and in a few days the young reptiles are hatched.

It appears that a species of true crocodile is found in Southern Florida on both coasts. It is hardly distinguishable from the alligator except by the shape of its head, though it grows bigger and attains a length of eighteen feet.

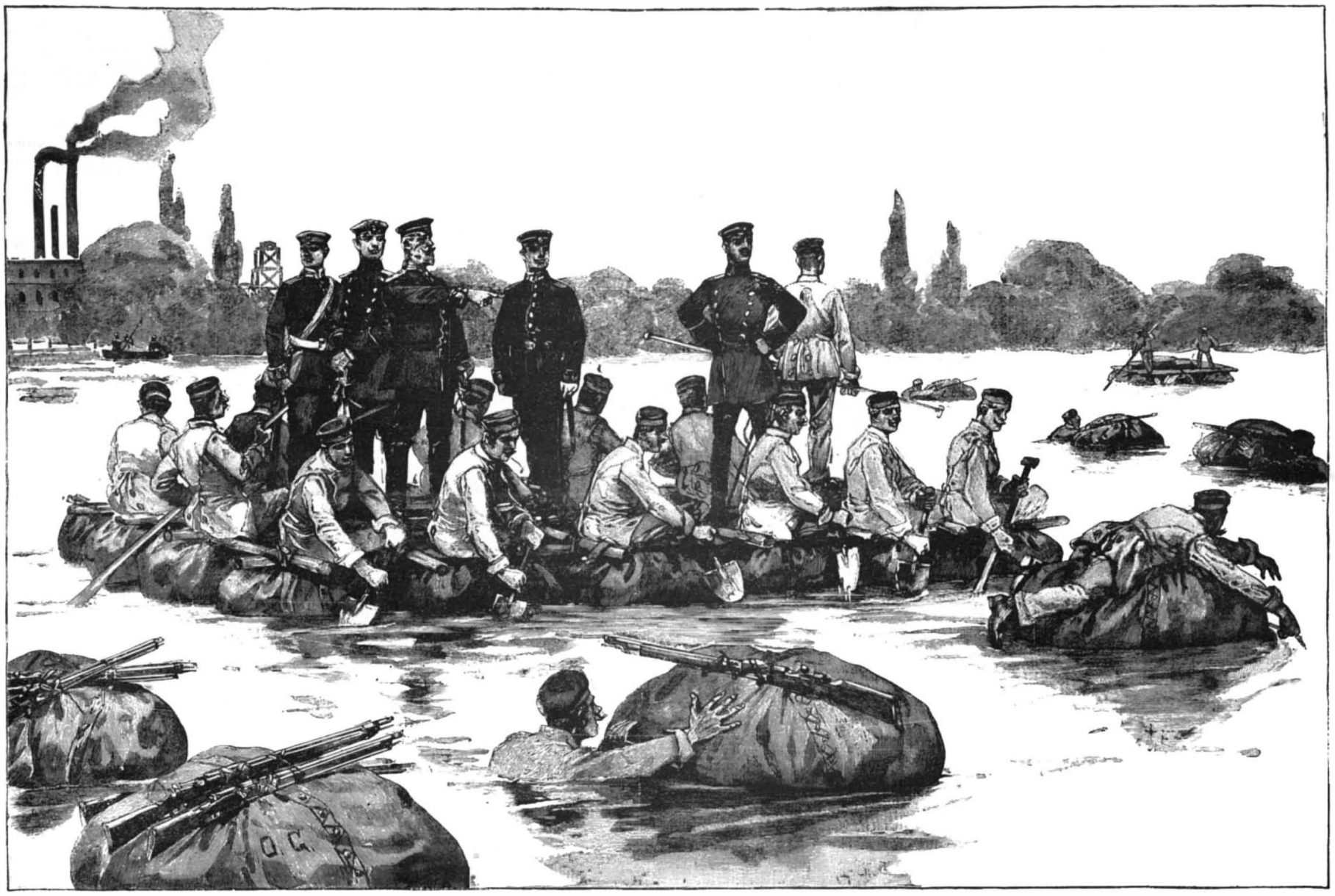
Dr. Hugh M. Smith, of the Fish Commission, says that young crocodiles are hatched for market in the same fashion. The mother crocodile lays her eggs in the sand like a turtle, and simply covers them over. Somewhat different is the practice of the maternal alligator, which in April or May seeks a sheltered spot on a bank and there builds a small mound. The foundation of the mound is of mud and grass, and on this she lays some eggs. She covers the eggs with another stratum of grass and mud, upon which she deposits some more eggs. Thus she proceeds until she has laid from 100 to 200 eggs.

The eggs, in the course of time, are hatched by the sun, assisted by the heat which the decomposition of the vegetable material generates. As soon as they have "chipped the shell" the baby alligators are led to the water by the mother, who provides them with food which she disgorges, showing much anxiety for their safety. At this early period of their existence they are exposed to many dangers, being a favorite prey of fishes and turtles. Alligators' eggs, by the way, are sometimes eaten by the Florida crackers. The robbing of the nests for market is helping to hasten the inevitable destruction of the alligator fishery, which has been an important and profitable industry in Florida. Facts recently gathered by the Fish Commission show that the reptiles cannot long escape practical extermination. Already they are becoming scarce, and the price of hides has gone up.

It is estimated that 2,500,000 alligators were killed in Florida between 1880 and 1894.

In 1890 about 250 pounds of alligator teeth were sold, hunters receiving from $1 to $2 a pound for them. They are removed by burying the heads and rotting out the teeth. Of the best teeth about seventy make a pound. The stuffing of alligators and the polishing of the teeth give employment to forty persons. Unfortunately, alligators grow very slowly. At fifteen years of age they are only two feet long. A twelve-footer may be supposed reasonably to be 75 years old. It is believed that they grow as long as they live, and probably they live longer than any other animals.

An Exhilarating Plant.—Palgrave, in his work on Central and Eastern Arabia, tells us of a plant whose seeds produce effects similar to those of laughing gas. It is a native of Arabia. A dwarf variety of it is found at Kaseem, and another variety at Oman, which reaches a height of three or four feet, with woody



PIONEER PRACTICE ON THE OBERSPREE, NEAR BERLIN—CROSSING THE RIVER ON FLOATS MADE OF TENT CANVAS.

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stems, wide spreading branches and bright green foliage. Its flowers, which are yellow, are produced in clusters. The seed pods are soft and woolly in texture, and contain two or three black seeds of the size and shape of a French bean. Their flavor is a little like that of opium, and their taste is sweet, while the odor from them produces a sickening sensation and is slightly offensive. These seeds contain the essential properties of this extraordinary plant, and when pulverized and taken in small doses, operate upon a person in a most peculiar manner. He begins to laugh loudly and boisterously, and then sings, dances and cuts up all manner of fantastic capers. The effect continues for about an hour. When the excitement ceases, the exhausted exhibitor falls into a deep sleep, which continues for an hour or more, and, when he awakens, he is utterly unconscious that any such demonstrations have been offered by him.

The Role of Water in the Vegetation of Plants.—Some recent researches of Mr. Gaire, says the Revue Scientifique, apropos of the influence exerted by the greater or less quantity of water upon the propagation of the established species of plants, establish the two following facts—the first, relating to seeds, and the second to tubercles: (1) The humidity of the soil favors and increases the rendering of fruit and seed, in number, in large proportions, but dryness produces larger and heavier seeds. In humid soil, the plant gives smaller seeds, and, by that fact, is liable to cause the degeneration of the species. (2) The number of tubercles is but slightly influenced by variations in the amount of water in the soil, but, in humid soil, the plant gives larger tubercles. There is, therefore, an increase in the rendering in weight. However, the polarity of such tubercles is not very marked, and they are consequently less perfect than those that have been submitted in the earth to relative dryness. In other words, the humidity, as may be seen, increases the immediate rendering, but causes the formation of imperfect reproductive bodies that will give rise to less vigorous plants. There is an advantage to the individual, but to the detriment of the preservation of the species.

The Sacred Lotus.—In the fountain basins of some of our city parks may now be seen in flower the sacred lotus, Nelumbo speciosum, a plant interesting for its associations as well as for the beauty of its large, pale, rose-colored flowers. It is found throughout India, China, Japan, Australia, the Malay and Philippine Islands, Persia, and even the Caspian Sea, but is no longer to be met with in the Nile. Herodotus, however, describes the plant with tolerable accuracy, comparing the receptacle of the flower to a wasp's nest. Strabo and Theophrastus likewise mention the plant as a native of Egypt. Sculptured representations of it abound among the ruins of Egyptian temples, and many other circumstances prove the veneration paid to this plant by the votaries of Isis.

In a manuscript of Dioscorides, supposed to be of the twelfth century, there is a figure of the Nelumbo under the name of kuamos, while under the name of lotos a tolerably good representation of Celtis is given. But the worship of the lotus was by no means confined to the ancient Egyptians, for in India, Thibet, China and Japan the plant was deemed sacred, and, indeed, is still employed in religious invocations and ceremonies. The leaves are covered with a fine microscopic down, which, by retaining a film of air over the upper surface, prevents it from being wetted when water is poured over it, the liquid rolling off in drops. The Hindoos have a proverb founded upon this peculiarity of the leaves, to the effect that the good and virtuous man is not enslaved by passion nor polluted by vice; for, though he may be immersed in the waters of temptation, yet, like a lotus leaf, he will rise uninjured by them. The leaf stalks abound in spiral fibers, which are carefully extracted and used as wicks to burn in the temples of India before the idols. The rootstock and seed are eaten as food in China, India and Australia.

The young leaves of these plants float upon the surface of the water, but as the stalk that supports them lengthens, they are carried upward. The fact of the contact of the lower surface of the leaf with the water, together with the structure of the upper surface as above described, accounts for the peculiar position of the stomata or breathing pores, which are to be found only within a small space in the center of the upper surface of the leaf opposite its junction with the stalk. The breathing pores are in communication with the air canals in the stalk.

Our American, yellow flowered species, N. luteum, also is said to have been deemed a sacred plant by some tribes of our Indians, who likewise used the seeds and rootstocks as food.

Preservation of Natural History Collections.—Mr. Walter Hough recommends, for the preservation of natural history collections against the attacks of insects, the following naphtho-arsenical compound: 570 grammes of a saturated solution of arsenic, 570 of naphtha, 140 of 95 per cent alcohol, 1 of phenic acid and 1 of a 10 per cent solution of strychnine.

CHURCH BELL FOUNDRY IN CINCINNATI.

Church bells are, with but little variation, made of copper and tin, in the proportion of copper 78 parts, tin 22 parts. Bell founders claim that all additions of gold and silver, etc., are of no practical value. As shown in our first page illustrations, the flasks whereon and wherein the mould is made consist of two parts, constructed of boiler iron, of a general bell form, and plentifully perforated with holes for escaping gas while casting, one being so much less in size than its fellow as to give space for the loam forming the mould between the two. No "pattern," as the term is generally used, is provided. The two parts of the mould are "swept" by "formers," accurately finished from thin iron to the form intended for the inner and outer surfaces of the bell. These "formers" are mounted and rotated over the applied loam as shown in Fig. 2. Five courses of loam and clay are successively applied, "swept," and baked, to complete each mould. Before this work is done, however, the inner flask is wound near the top with a rope made of hay. As the shrinkage is very great as the castings cool, difficulty would be met with in getting the flask and loam out of the nearly parallel inside top; this "pinch" is obviated by using this destructible base, which permits the collapse of the loam after the heat of the metal has consumed the hay.

The five courses laid on the flasks are: Loam; a mixture of loam, fire clay, and manure; two successive coatings of powdered fire clay; and, lastly, a thin coating of brick and fire clay combined with foundry facing. Each of these coatings is baked in an oven before the succeeding one is applied. The coatings are "swept" by the formers, as applied, both in the inner and outer flasks, by careful adjustment as to thickness of materials, so that when the exterior mould is placed over the interior, a space corresponding to the intended thickness and shape of the bell shall exist, as shown in Fig. 3. Inscriptions or embellishments to be made upon the bell are provided for with the last coating by means of a "knurl" or wheel, having the desired motto raised upon its periphery, the wheel being carefully rolled around the soft surface and leaving its imprint in the clay. Other designs are impressed from dies of the required ornament, and the usual "beading" is accomplished by notches in the edge of the sweep.

The two parts of the flask being placed together, as shown, are firmly held in position by many clamps; the tendency of hot bell metal to squeeze through and force a separation of flasks being very great. As the mould nears completion, a fire is started in a near-by reverberatory furnace, in which is placed the desired charge of copper, and, when the copper is melted, the tin is added in its proportion.

The melted bell metal being ready, the furnace is tapped, the bright stream caught in a huge ladle swung over the mould by a crane and poured into the open mouth of the mould till it is filled, as shown in our large view. After cooling and removal from the mould, the bell is usually polished with sand and water in special revolving grinding machines. The tongue and clapper, the yoke and wheel are now attached and the whole suspended in its frame. In making a chime, the bells are, after completion, temporarily set up and regularly tested by skilled bell ringers, from the permanent chiming stand of the foundry, as shown in Fig. 4.

Our illustrations are from sketches made in the Buckeye bell foundry, E. W. Vanduzen Company, Cincinnati, O. This foundry is now preparing to cast a large bell for a Roman Catholic church in Cincinnati; it will weigh nearly 30,000 lb., and will be 9 feet in diameter. Our sketch, Fig. 5, gives an idea of its size.

A bell of such proportions will have to be moulded and cast in a pit; and withal it is so large, with the system of hanging and yoking devised by this firm, its ponderous mass will swing as easily as an ordinary sized bell.

Atlanta Exposition Notes.

The work of installing exhibits in the buildings of the Cotton States and International Exhibition is going along rapidly. The concessionaires on Midway Heights are getting their structures ready and the long amusement street is beginning to assume the appearance of completion. There is every prospect that by the opening day, September 18, everything will be in readiness.

Twenty ostriches have been shipped from Anaheim, California, to the Exposition.

The Patent Office will exhibit an array of models, the choice having been made in this instance with special reference to machinery and implements used in Southern industries.

At the Atlanta Exposition the drama will have a place among the exhibits. A model theater is in process of erection, attached to which will be a theatrical museum, containing relics of interest in the history of the drama and a collection of portraits of celebrated actors. Leading stock companies of the country and dramatic schools will give performances, and during the Exposition the ten best plays by women now living will be presented. A spectacular melodrama entitled, "De Soto; or, the Fall of the Incas," will also be presented. The theater will open on October 15.

The exhibit of the Smithsonian Institution and National Museum being installed in the Government building at the Cotton States and International Exposition is, for its size, the most beautiful and impressive that has ever been prepared.

There will be wax figures of all the leading races of men, in characteristic costumes, especially prepared for the Atlanta Fair. The exhibit of the National Museum will be an epitome of the museum's entire collection. It will include a display of the birds, beasts, and serpents of North America, and a collection of the mammals of the world, represented by types. Representative groups will be stuffed and mounted amid accessories representing their environment in life. The same will likewise be done with the birds. Another exhibit will show the history and development of games the world over, including the history of chess and playing cards, and the games from which they took their origin in the earliest times. The relics of prehistoric man will occupy a large space. One of the most notable features of the exhibit will be that part devoted to biblical archæology, which will show either originals or facsimiles of the most famous editions of Testaments and Bibles, including some of the rarest copies in the world. Specimens of all the precious stones mentioned in the Bible will be shown, a model of the high priest's breastplate, a reproduction of the tower of Babylon, supposed to be modeled on the plan of the tower of Babel, a group of models of all the musical instruments mentioned in the Bible, figures illustrating Jewish religious ceremonials, and many other attractive biblical features.

Atlanta Exposition.

The Maryland Farmer has had compiled the following list of special events which are to come off on the several days mentioned below, commencing at the opening of the Exposition, September 18, till its close, December 31, 1895.

Sept. 18th—Opening Day—Liberty Bell Day.
19th—Georgia Editors' Day.
25th—Kentucky Press Association.
28th—New England Women's Press Association.
Oct. 1st—Missouri Press Association, Texas Press Association.
1-2d—Southern Mining Convention.
2-4th—Georgia Bar Association, South Carolina Press Association.
5th—Tennessee Day.
7th—North Carolina Day.
7-9th—National Irrigation Congress.
8-11th—American Institute of Mining Engineers.
9th—Chicago Day.
10-16th—Farmers' National Congress.
10-17th—Women's National Council.
16th—Bankers' Association of America.
17-18th—Road Parliament.
18th—Commercial Travelers' Day.
18-19th—Daughters of Revolution.
19th—Virginia Day. Orator, Gen. Daniel.
21st—Connecticut Day, Seidl's Orchestra.
22d—Georgia Association of Manufacturers, Seidl's Orchestra, World's Fair Lady Managers.
23d—President's Day, Seidl's Orchestra.
24th—City of Washington Day, Women's National Press Association, International League of Press Clubs.
25th—South and West Trade and Grain Congress, Seidl's Orchestra.
26-Nov. 1st—Educational Congress.
27th—Pennsylvania Day.
30th—Wesleyan Female College.
30-31st—National Association Household Economics.
Nov. 1st—Louisiana Day.
2d—Women's Federation of Clubs, Women's Educational Congress.
5th—Women's Christian Temperance Union.
7th—Daughters of Confederacy, Southern Female College, Pennsylvania Day.
8th—Peabody Normal.
9th—Delaware Day.
11th—Association for Advancement of Women.
12th—Georgia Day, Women's Press Clubs, Grady Day, Georgia Editorial Day.
13th—International League, Women's Press Clubs.
16th—Kentucky Day.
20th—Letter Carriers' Day.
21st—Connecticut Day.
28th—South Carolina Day, Library Day.
29th—Lucy Cobb Day, Library Day.
Dec. 3-5th—National Brickmakers' Association.
6th—Rhode Island Day.
10-11th—Woodmen of the world.
28-29th—International Folk Lore Association.
31st—Exposition closes.

THE people of the United States use, on an average, 12,000,000 postage stamps of all kinds every day, or a total of about 4,380,000,000 per annum.

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Correspondence.

Mathematical Memorizing.

To the Editor of the SCIENTIFIC AMERICAN:

The mental feats of the blind Prof. Simpson, as portrayed by your correspondent of July 27, recalls to mind a still more wonderful effort of memory by a schoolmate of the writer in 1855 at the Lancastrian public school of New Haven, John E. Lovell founder and principal, noted for its instruction in elocution, map drawing, and mental arithmetic.

Among the latter exercises was a system of cross multiplication, scholars beginning with two factors and gradually working up, eighteen being about the limit. Charles B. Parkman, now and for many years in the United States Treasury Department, this city, one day undertook to do forty figures in each factor. A blackboard was placed in the middle of the large schoolroom with the two long lines of figures upon it, none higher than 6. With two blackboard pointers in his hands he commenced his task; went to dinner at noon, remembering his figures and his carrying figure, and finishing in about five and a half hours of working time. Not a figure was put down, nor was the example worked out until the answer had been given and taken down, if remembered rightly without a skip. He was then not over sixteen years of age, and received a gold medal for his feat. J. S. A. BAKER.

Washington, D. C.

Spanish Oranges and Lemons.*

The varieties are numerous, at least in the names given them, though in quality, size, shape, and flavor, there is but a slight difference between most of the varieties grown. The oranges known as "China Dulce" and the "China Agria" are practically the only ones exported to foreign countries, being shipped chiefly to France, England, and Germany, none having been shipped to the United States during the past year. Both of these varieties are nearly round and of different sizes. Three sizes are exported. Of the smallest size, 720 are put in a crate; of the next size larger, 420 to 500 are packed in the export crate; and of the largest size, about 300. These varieties, when ripe, have delicious flavor, and are very juicy—the sweet of one is of a very palatable sweetness, while the slight acidity of the other is highly appreciated. They are called "China" because, according to the historical notice given, they were brought to the Continent of Europe from China.

The introduction of the orange into Europe from China dates back to the year 1333. It was first brought to some province of France. In 1421, it was taken to Pamplona, Spain. Slips or seeds were then taken to different parts of the country and it is now cultivated in many places along the Mediterranean coast of Spain.

Another variety, called the "Cajel," is, in size, shape, quality, and flavor, similar to the "China." This variety, however, is consumed in Spain, as it will not keep for export.

There is another variety, called "Grano de Oro," which, it is said, was brought from the island of Malta to this place forty or fifty years ago. It is now grown in some of the towns in this province, not, however, very extensively; consequently none of this variety is exported. It is not very juicy, and, by some, is pronounced sweet to insipidity, while others declare it delicious. Americans who have tasted this fruit declare it equal to the California orange which, they say, bears the same name and is of the same class.

Another variety is known as the "Cana Dulce." This variety had its origin in Malaga, having been obtained by grafting with other varieties of oranges, and, some say, with sugar cane. At all events, it has a slight sugar cane flavor. It is much more juicy than the "Grano de Oro," with a much more palatable flavor, the sweetness not having the insipidity which characterizes the "Grano de Oro." In shape and size, it is about the same as the "Grano de Oro." The production is small, and is consumed in the country.

The quantity of oranges exported in 1894, of the "China Dulce" and "China Agria" varieties—the only class exported—was 5,417,352 kilogrammes (11,939,804 pounds), valued at $139,439.05.

LEMONS.

Arabic writers speak of the lemon tree in Andalusia during the latter part of Moorish rule in this country. The method of propagating the tree at first seems to have been to graft a slip upon the citron tree. The result of this grafting, from some cause, seems to have given lemons of two different shapes, the one elliptical, the other almost round. The former are called "Reales" (real lemons) and the latter "Castellanos." It is these two classes that are exported, the former being the most highly appreciated. Of the above classes, there were exported in 1894, 5,454,120 kilogrammes (12,020,880 pounds), valued at $172,931.52. Of this quantity, the United States took 41,766 boxes, valued at $66,256. The inferior grade is shipped to the United States, the second grade to England and Germany, and the first grade to France and Holland. The old method of propagating the lemon tree by grafting it upon the citron has been abandoned because horticulturists have found that grafting on the "Naranja Agria," or tree of the acidulous orange, gives better results and produces a healthier and more juicy fruit. This is partly accounted for from the fact that the roots of the orange tree go deeper into the earth than the roots of the citron, and, consequently, are not affected so much by drought, and that the tree is freer from disease than the citron tree. The sweet lemon is not cultivated to any great extent, and those grown are consumed in the country.

When the lemons have attained their maximum growth, and while yet green, they are picked from the tree. After picking, they are piled up under the tree, remaining in the pile from twenty-four to forty-eight hours, for the purpose of seasoning sufficiently so that they may not become stained or spotted while being taken from the places where grown to Malaga, to be prepared for shipment. They are transported from the orchards in large two-wheeled carts, generally drawn by oxen. On arriving at Malaga, they are taken from the cart, placed in small piles upon the ground, near the warehouse of the shipper, and girls and women begin at once to wrap them in tissue paper for shipment, after the classification for the different foreign markets is made. The inferior quality, going to the United States, is placed at once by the wrapper into the boxes in which they are exported. She wraps and packs at the same time. The first quality, however, after being wrapped with more care, is placed by the wrapper in a basket, and the packing is done by another person. Three to five days usually elapse after picking the lemons from the tree before they are wrapped and ready to be shipped, and, not unfrequently, they remain a day or two on the wharf before being placed on board. They may remain before being shipped as many as twenty-five to thirty days, provided they are kept dry.

They are brought to Malaga from surrounding towns at distances varying from six to thirty miles. When wrapped and packed they are actually green and perfectly green in color. They ripen and become yellow during the time of their transportation. There is no artificial process employed here, as some suppose, for ripening and yellowing the lemon. This is not considered necessary by the shippers here. The time elapsing from the picking of the lemon for export until it reaches its destination is sufficient to ripen and yellow the lemon. Both ripeness and yellowing might be hastened, however, by placing the lemons in a pile when picked, covering the pile with cloth and allowing them to remain under the sun, thus covered, for three or four days. But they must not be exposed to the rain.

More attention is being given to the culture of lemons than formerly, in consequence of which the quality is improving, the number of trees is increasing, and the quantity obtained from each tree is increasing also.

* From the Report of David N. Burke, United States consul at Malaga, to State Department.

Fires in Europe.

A few days since we had accounts of a terribly destructive fire in Paris. The fire commenced in temporary wooden buildings, and the water pipes were out of order and useless. This could not well occur in Geneva, for there are no wooden houses. All the houses are of stone, and the walls, the floors and partitions are made solid, with no open spaces. There is little for a fire to get hold of. The curtains and wood work of a single room may take fire, but it cannot extend beyond. By law, every house is compelled to keep a tank of water at the top, holding from 1,000 to 2,000 gallons, with pipes leading all over the house. A gentleman who has lived all his life here tells me that he cannot remember when a house was burned down. No gas pipe is allowed to be built in the wall or put under the plastering.

In London every public building from the Queen's palace down is compelled to be supplied with Phillips fire annihilators. These machines (the largest) will produce 17,000 gallons of carbonic acid gas and steam in the space of four or five minutes. A fire breaks out in a house, commencing in a single room. The room is filled with smoke and cannot be entered. A man pours a stream of water in, but it does not extinguish the fire unless it touches the source from which the flame springs. It has no more effect on the flame (the main source of heat) than a stone thrown through it. It is the flame that creates the heat and draws out the inflammable gas from the wood. It needs something to extinguish the flame. This the annihilator does. A fire starts in a room, you catch up your annihilator, strike a rod at the top with your fist, then throw it into the room and shut the door. In five minutes that 17,000 gallons of the most deadly enemy to fire is produced. It penetrates every crack and crevice of the room. You open the doors and let out the smoke and steam, and find the walls dripping from the condensed steam. There may be a few live coals on the floor, which can easily be extinguished with a pail of water.—Cor. St. Albans Messenger.

Spider Silk.

At the beginning of the eighteenth century, Bon, first president of the audit office of Montpellier, presented to the Academy of Sciences some specimens of silk manufactured from the cocoons of spiders of the south of France. The difficulty at that time consisted in procuring a sufficient quantity of cocoons to allow the manufacture to become practical. Since that epoch there have been found in Asia, Africa, America, and Oceanica spiders that produce silk in considerable quantity. Francis Garnier, in his voyage of exploration in Indo-China, calls attention to a spider indigenous to the province of Yun-nan that produces a very strong thread, which, according to him, is used for manufacturing a fabric peculiar to the country called "tong hay tonan tse," satin of the eastern sea. Mr. A. Fauvel, who resided in China for a long time, also observed this spider, which weaves in the pines webs of yellow silk so strong that small birds are sometimes taken therein.

In Java and New Guinea there are large spiders that weave immense webs that reach several yards in diameter and are of incredible strength and solidity. Dr. A. Vinson, in his fine work entitled Les Araneides de la Reunion (1863), thus describes the large and well known spiders of Reunion Island: "It is to the wrinkled stipes of our large Pandanuses, which ascend skyward in opening their spirally imbricated, insiform leaves, that our gigantic Epeiræ attach their long silky threads and establish them from one tree to another at a distance of several yards. In these strong webs, multiplied and very broad, they are counted by hundreds, living in communities and in perfect harmony. They are found of all ages and of all sizes. They consist of the species known as the black and the golden Epeira, which are so good commensals that the Linyphies establish themselves upon their great webs in order to capture small prey thereon."

So, too, in Madagascar, and in Australia, upon the west coast of Africa and the banks of the Congo, and in Paraguay and the Argentine Republic analogous species have been found.

Reaumur, who was commissioned by the Academy to examine the experiments of Bon, mentioned above, showed that the great difficulty in the way of utilizing the silk was that of procuring cocoons in sufficient quantity. He remarked that if it were desired to obtain a satisfactory result, it would be necessary to operate directly upon the thread as it comes from the spinneret of the spider, and not upon the cocoons or the silk. Mr. Rolt, an Englishman, made some experiments with the Epeira diadema. He wound its thread in measure as it was produced and found that the animal furnished it in a continuous manner for about five minutes with a speed of 165 feet per minute. He presented to the London Society of Arts a specimen of silk of about twenty thousand feet that had been spun by twenty-two spiders in less than two hours.

The Rev. P. Camboue, a missionary at Tananarive (Madagascar), has very recently made some experiments upon the silk of a large spider of the country, the "halabe" (Epeira Madagascariensis). He fixed two of these spiders in a box in such a way as to allow the extremity of their abdomen to project externally. He then began to wind the thread secreted by these animals. Each spider yielded him about one hundred yards of silk of a beautiful golden yellow. He remarked that the thread was formed in much greater quantity after oviposition. At this epoch, a single spider yielded him 2,000 yards of it in ten days, and another furnished him 4,000 yards in twenty-seven days. This thread, which was strong and tenacious, was capable of supporting a weight of 50 grains, and of elongating 13 per cent. Thanks to an ingenious apparatus of his invention, Father Camboue was easily able to reel and twill the thread. He sent to the National Society of Acclimatation of France some cards of silk thus obtained.

These experiments, which will certainly be resumed, demonstrate that the day is coming when this new textile will enter the silk industry. Moreover, some experiments in acclimating the "halabe" of Madagascar have been made in France. The rearing of these new insects has been intrusted to Mr. Fallou, who, thanks to his care and perseverance, will perhaps succeed in keeping them alive, especially after their method of feeding shall become better known. Moreover, the fecundated eggs as well as the young spiders still in the cocoons do not appear to suffer from the trip from Madagascar to Europe. The animal seems, besides, to accommodate itself to all climates. In fact, it inhabits the low and torrid regions of the coast of the African island as well as the temperate and cold highlands of the center. The "halabe" possesses other valuable qualities. In addition to the fact that it feeds upon cockchafers and locusts, its thread might be employed in electricity on account of its insulating properties and furnish useful aid to meteorology in the interim of the generalization of the use of it as a textile material.—Le Magasin Pittoresque.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR BRAKE.—Charles F. Shoemaker, Chicago, Ill. Each truck axle has near each wheel, according to this improvement, a V-grooved brake wheel, adapted to be engaged by a brake made in two segmental sections, each section carrying a V-faced shoe. The upper ends of the brake sections are connected by an angled lever to a cross head between the trucks, and the cross heads are connected by toggle links with crank arms connected with the brake lever. The brake may be quickly applied and released, its action being positive and the construction very simple.

AUTOMATIC GRIP RELEASE.—Eugene A. Walters and Fred J. Maxon, Walworth, Wis. This invention provides a simple mechanism to cause the grip to automatically release its hold on the cable at crossings and other places where it is necessary to drop the cable. Combined with the grip lever and its locking pawl is a toothed locking bar hinged at one end and free at the other, a tripping mechanism supporting the free end of the locking bar in its normal working position, and adapted to be adjusted to effect movement of the locking bar away from the pawl. The traction strain does not antagonize the tripping devices and the automatic mechanism is made to act with sensitiveness and certainty.

Mining.

GOLD SAVING APPARATUS.—Dennis G. Frisbie, Dayton, Wyoming. For placer and quartz mining this invention provides a settling tank discharging at its lower end into a chamber having a false perforated bottom, and an inclined copper plate forming one side of the chamber, so that the material in rising in the chamber passes over the copper plate to the outlet in the top of the chamber. But a small quantity of water is required to wash the material through the several parts of the machine, and any mercury that escapes from the quartz mill is readily caught, the apparatus being designed to save nuggets, and coarse and flour gold, with but little labor.

Mechanical.

WHEEL BRUSH.—Charles Wiebke, Jr., Newark, N. J. This invention provides means for making a brush with a smooth working surface or a saw-tooth surface, the bristles being assembled without the aid of a skilled workman and held firmly in place, being held the more securely as the brush is revolved the more rapidly. A locking device connects opposing head plates between which are held the knotted ends of bunches of bristles, the bunches being placed one on the other to break joints, and being held together with a wedge-like force.

COMPRESSION PUMP.—Harry L. Parker, Princeton, Ill. This is a pump adapted to compress and force ammonia and other gases, and is well adapted for use in connection with ice-making plants. It has an oil or other liquid circuit arranged to keep its movable parts thoroughly lubricated and at the same time absorb the heat of compression, and the pump cylinder and piston are arranged in connection with the oil to force out every particle of gas from the pump cylinder.

CARROTING MACHINE.—John H. Sanders, New York, James E. Carlin, Brooklyn, N. Y., and Hugh Fitzpatrick, Easton, Pa. This machine is designed to dress and prepare furs for hat making much more rapidly and nicely than the work can be done by hand, applying the acid evenly and saving it that it may be reused, and polishing and wringing out the fur, which is delivered in a finished condition at the rear end of the machine. The machine has a rotary brush arranged behind feed rollers, a pelt bearing opposite the brush and wringing rollers beneath it, there being an acid pan beneath the brush and rollers, while a jet pipe is arranged to deliver near the brush, and a system of tanks and pipes is provided whereby the acid may be delivered under pressure to the jet pipes and discharged from the acid pan.

Agricultural.

CORN PLANTER.—Joseph Urbanek, Schuyler, Neb. This invention provides a simple and positive movement for the seed-drop slide, and also provides markers which may be set as desired and will act automatically and regularly, indicating by depressions in the ground the planting of each hill.

GUIDE MARKER FOR CORN PLANTERS.—Herrman A. Behrns, Orchard, Iowa. This is an improvement on a formerly patented invention of the same inventor, simplifying the construction and providing means whereby the driver may readily change the marking device from one side of the machine to the other, or balance it, raising both markers from the ground when turning a corner. The marking bar is steadied in its movement by a wire rope or cable carried through guide eyes to the forward end of the planter.

INSECTICIDE SPRAYER.—Albert G. Provine, Puyallup, Washington. This is a wheeled sprayer in which longitudinal pipes at each side of the machine are connected with a supply pipe, the pipes being pivotally supported at their front ends and provided with vertical pipes having discharge nozzles. The groups of nozzles may be adjusted toward or from each other, according to the width of the rows of plants, and are automatically maintained in vertical position irrespective of any unevenness of the ground.

FARM GATE.—Randolph F. Hageman, New Madison, Ohio. This is a gate which may be readily swung open or closed by one on foot, on horseback, or in a vehicle. A weighted tumbler lever is pivoted to the supporting post and has a link connection with a pivoted angle lever carried by the gate, there being also angle levers with weighted handles on posts in line with the supporting post, and a connection between such levers and the tumbler lever.

Miscellaneous.

FARE RECEIVER AND REGISTER.—John Evans, Kensington, South Australia. This is a portable device available wherever a fare, ticket or entrance fee is charged, which it is desired should be safely stored and correctly registered. The fare box comprises a case in which a hinged receiver swings in and out, there being a verifying window in the case and a hinged flap below the receiver adapted to be moved toward the receiver, while a tube on the lower part of the case is connected to a storage receptacle. There is a registering apparatus in the case and an operating lever having connections with the receiver and with the registering apparatus.

STOCK INDICATOR.—Roscoe L. Mark, Davenport, Iowa. This invention comprises a peculiar construction and arrangement of a sheet metal base or carrying plate with numerous detachable and interchangeable tablets bearing figures, letters, characters or headings, together with a novel organization of a frame to carry the tablets and store them when not in use. It may be used to keep account of mercantile stock on hand, as a stock indicator for brokers, for a perpetual calendar or any similar use where items or quotations need to be frequently and readily changed.

FIRE HOSE SUPPORTER.—James E. Bramble, Gainesville, Texas. For supporting hose to faciltate thoroughly washing and drying it, skeleton frames are provided which may be easily spread out horizontally and may also be elevated to hold the hose away from the ground and open to air currents, the hose being held in a manner to avoid injuring it. The device is designed to carry a large quantity of hose and permit work to be very conveniently done on it.

ORDNANCE.—John Graham, Davenport, Iowa. This invention provides for the construction of a gun capable of carrying a double shot which acts, after it is fired, in the nature of a bomb or torpedo. The bore of the gun is surrounded by chambers adapted to hold water and centrally in the barrel extending nearly to the muzzle is located a tube, the shot having an opening through it and fitting upon the tube, while a second shot held in the muzzle of the barrel is provided with a tube adapted to be filled with an explosive and projecting into the central tube of the barrel.

PIPE JOINT COVER.—James L. Woodside, Hawarden, Iowa. To produce a continuous pipe from stove pipe sections or other sheet metal tubular pieces, a sheet metal band has its end portions adapted to lap one over the other when the cover is applied to the joint, the band being grooved and its side edges bent, while two straps are secured on the outer side of the band, one slotted and each having an inclined ear, the ear on one strap sliding in the slot of the other, while an edge-tapered key separates the ears and contracts the band.

TOOL TO CLINCH HORSE SHOE NAILS.—Joseph Rosch, Wurtsborough, N. Y. This tool has pivoted handles, one of which has near the pivot a slot, adjacent to which is a serrated lip terminating in a grooved shoulder, there being a clinching arm pivoted in the slot of the handle and extending over the lip, a clinching plate pivotally connected to the free end of the arm and a link extending through the slot and pivotally connected to the clinching arm and the other handle.

MAKING HÆMATIN ALBUMEN.—Niels R. Finsen, Copenhagen, Denmark. This invention relates to the production of a new product possessing nutritive properties of great value as food, being a composition made by mixing diluted defibrinated blood with an acid, coagulating the albumen by heating to about 195° F., and washing the albumen with water, drying and heating the product in vacuo at 100° F. and reducing to a fine powder. The new product may be kept for a long time without deterioration and is free from after taste.

TEMPORARY LOCK.—Paul Hopfgartner and Mathias Hoehnen, Pocatello, Idaho. For temporarily securing a door having an insufficient lock, or without one, these inventors provide a simple and inexpensive device which may be folded to carry in the vest pocket, and which may be quickly applied, irrespective of the space between the door and the jamb. A body plate having spurs on one face and a bolt socket is adapted to be secured in the door jamb, and hinged to its outer end is a bolt-carrying bracket, to be swung against the closed door, when the bolt may be made to enter the socket, there being hinged auxiliary spacing plates to take up undue space between the door and the jamb.

HAME.—Moses Johnson, Harrisburg, Ill. To facilitate attaching the chain hook or tug loop to the hame this invention provides a simple and inexpensive arrangement of parts readily adjustable to raise or lower the hook or loop, and allowing the hook or tug members to be detachably and interchangeably connected with the hame. The pintle member may be readily moved out of its bearing portions, and is held normally in place and locked from movement by a simple swinging latch member.

THRESHOLD AND WEATHER STRIP.—Norman N. Hazelton, Lamoni, Iowa. According to this improvement the threshold has a hinged section over which fits a door section, and the hinged section is engaged by a spring lifter which is deflected by pressure when the door is closed, the lifter being thus thrown under pressure and holding the hinged section tightly against the other section.

HOOK AND EYE.—Ellen Donnelly, Hempstead, N. Y. Both hooks and eyes are, according to this improvement, provided with shanks for attachment to a garment without the use of thread. A facing strip is employed through which the pin extensions of the hook and eye are passed, when the facing strip is carried over the shanks and stitched down at its edge to the garment.

BOOK HOLDER.—Melvina Beyer, Philadelphia, Pa. This holder is especially designed for conveniently supporting a book while reading, and may be quickly folded to take up but little room when not in use. Its base has a cut-out portion in which may be folded pivoted arms and an extension, a U-shaped rest being pivoted by its side arms on the sides of the base, while turning in the front end of the base are leaf holders adapted to engage and hold open the leaves of a book.

PICTURE.—Ludwig Knoefel, New York City. This is a new article of manufacture, consisting of a picture made on a white marble slab having a grained surface, the drawing being made by a lithographic crayon, and a coating of varnish covering the drawing and the grained surface, whereby the marble may be washed without spoiling the drawing.

STOPPLE AND HAND HOLD.—John P. Miller, Santa Cruz, Cal. This is a device to place on the pen holder, affording a stopple by which the ink bottle may be closed and the pen held in the ink well and clear of the ink when not in use, while the pen may be conveniently pressed into the ink when desired, the device also affording a yielding bearing for the fingers in holding the pen while writing.

DISTRIBUTING BOTTLE.—Edward W. Dinsmore, Lynn, Mass. For table sprinkler bottles with salt or other substances, flour sifters, etc., this inventor has devised an improvement whereby the contents of the bottle are stirred up and loosened to facilitate free sifting. A stirrer whose ends are journaled in the top and bottom of the bottle is operated to agitate the contents of the bottle by turning the base or stand or by rotating the bottle.

Designs.

TRIMMING.—Friedrich Hassenpflug, New York City. The body of this trimming is formed of loop-like wings of triangular form and regularly varying as to length, extending from a common center.

GARMENT HOOK.—C. W. Raker, Shamokin, Pa. This is a hook formed of bent wire with curved loop arms of different lengths and rearwardly extending bent members.

CHANGE PLATE OR TRAY.—William T. Murphy, New York City. This tray has rounded ends, its outer sides being vertical while its inner edges have a gradual slope to the bottom.

SIDE DRIER FRAME.—Alfred H. Smith, Wilmington, Del. This is an improvement for paper-making machines, the frame having a lower section from which rise pillars having side extensions at their upper ends.

BED WARMER.—Robert Goodwill, Shamokin, Pa. This warmer comprises a cylindrical vessel, on one side of which are lugs to receive a bail and a capped opening, the other side being slightly flattened that the vessel will not roll when set down.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

CATALOGUE OF THE BOOKS RELATING TO ACHITECTURE, CONSTRUCTION AND DECORATION, IN THE PUBLIC LIBRARY OF THE CITY OF BOSTON. Subject Catalogue No. 10. Boston. 1894. Pp. 150. 8vo. Price 50 cents.

Though of course primarily intended for a finding list to assist readers at the splendid Public Library in Boston, its usefulness is by no means limited to the persons who have access to that collection. This bibliography of architecture, though of course necessarily restricted to the books in the collection of the library, is full enough for all ordinary purposes, as the Boston Library, like the Avery Architectural Library, of Columbia College of New York City, is particularly strong in books on architecture and the allied arts. The arrangement of the catalogue is admirable, the classification under nearly ninety heads rendering it easy to find all of the books on a certain branch of the general subject at a glance. For instance, there are separate heads for amphitheaters, stereotomy, stained glass, etc. The trustees of the library have placed the pamphlet at a merely nominal price, so that it is within the reach of all who are in any way interested in the subject.

NOTES ON SOME AUSTRALIAN AND OTHER STONE IMPLEMENTS. By A. Liversidge, M.A., F.R.S., Professor of Chemistry in the University of Sydney. Read before the Royal Society of New South Wales. Pp. 15. 12mo. Plates XIII.

All of the specimens figured, with one exception, were obtained directly from the natives or from the localities formerly occupied by them. The process used in reproducing the implements retains all the minute pits and other markings, as well as the effect of wear. Process engraving is specially adapted to show archæological specimens and natural history specimens, and the present pamphlet is a successful example of its use.

DOMESTIC ELECTRICAL WORK. By William A. Wittbecker. New York: David Williams. 1895. Pp. 55. 12mo. Twenty-two diagrams. Price in paper 25 cents, in cloth 50 cents.

This is a thoroughly practical work which gives concise explanations for plumbers, tinners, and hardware dealers on how to wire buildings for bells, alarms, annunciators, and for gas lighting from batteries. If the workmen of the trades for which this little pamphlet is intended would make a study of it, there would be less botch work in houses. The diagrams are admirable. It is only to be regretted that the author did not produce a larger work.

JAHRBUCH FUR PHOTOGRAPHIE UND REPRODUCTIONSTECHNIK FUR DAS JAHR 1895. Edited, with the collaboration of eminent scientists, by Dr. Josef Maria Eder. Halle a. S.: Wilhelm Knapp. 1895. Pp. 636. 12mo. 162 engravings and 25 plates. Price 8 marks.

This great German photographic annual nearly always contains more scientific articles than either the English or American annuals, and the present volume is no exception to the rule. The bibliography is excellent and the plates illustrate the recent progress in photo-mechanical work. Probably the most interesting illustration in the book is one showing a diver taking a flash light photograph on the bottom of the sea.

PRINCIPLES AND PRACTICE OF AGRICULTURAL ANALYSIS. Vol. I. Soils. By Harvey W. Wiley. Easton, Pa.: Chemical Publishing Company. 1894. Pp. 607. 8vo. 93 illustrations, 7 plates.

The work is intended as a manual for the estimation of soils, fertilizers, and agricultural products for the use of analysts, teachers and students of agricultural chemistry. The present volume is devoted to soils. The usefulness of the chemical analysis of soils in practical agriculture is admitted by most advanced agronomists, and certainly no one is better fitted to write an authoritative work on the subject than Dr. Wiley, Chemist of the United States Department of Agriculture. The volume deals with rocks and rock decay, the origin of soils, the taking of samples for analysis, treatment of samples in the laboratory, physical properties of soils, mechanical analysis, estimation of gases in soils, chemical analysis of soils, examination of waters, etc. The work places in the hands of teachers and students of agricultural analysis the principles which underlie the science and art of the analysis of soils and the most approved method of conducting it. The literature of chemical analysis is fortunate in obtaining within a year two such acquisitions as Benedikt's "Chemical Analysis of Oils, Fats, and Waxes," and Wiley's "Soils."

PRACTICAL HOT WATER HEATING, STEAM AND GAS FITTING. By James J. Lawler. New York: Excelsior Publishing House. Pp. 284. 12mo. 82 illustrations. Price $2.

This work contains simple directions for the construction of steam and hot water heating plants and how to do gas fitting properly. Plans for different kinds of buildings are given, as well as working drawings of details. The book explains how steam and hot water plants are erected and operated. Special attention is given to the location of defects, such as noises in water and steam pipes, and how they may be remedied. Gas fitting is also explained in all its branches, from the tapping of the main pipe in the street to the burners in the house.

THE DANCE OF THE BLACK CAT. (Polka caprice.) Composed by Moude Levia. New Orleans, La.: Paul T. Wayne, 1001 Canal Street.

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(6608) E. B. R. says: Will you kindly inform me as to the simplest way to remove a small peach stain from a light colored summer dress? The pattern is green and white stripes. The cloth is cambric or gingham. A. Most fruits yield juices which, owing to the acid they contain, permanently injure the tone of the dye; but the greater part may be removed without leaving a stain, if the spot be rinsed in cold water in which a few drops of aqua ammonia have been placed before the spot has dried. Wine stains on white materials may be removed by rinsing with cold water, applying locally weak solution chloride of lime, and again rinsing in an abundance of water. Some fruit stains yield only to soaping with the hand, followed by fumigation with sulphurous acid; but the latter process is inadmissible with certain colored stuffs. If delicate colors are injured by soapy or alkaline matters, the stains must be treated with colorless vinegar of moderate strength.

(6609) L. C. says: Will you be so kind as to tell me through your paper of a good way of cleaning lenses, eyeglasses, etc.? A. A very soft chamois skin is best; if greasy, wipe with a little tissue paper wet with weak alkali. Lenses should be cleaned as rarely as possible; use old linen, not silk. A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder, or very fine rouge, and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

(6610) E. F. R. says: Please let me know the composition of making the stereotype paste for the Brush papier mache process. A. Take 5 ounces flour, 7 ounces white starch, a large tablespoonful powdered alum, and 4 quarts water. Put the flour, starch, and alum into a saucepan, and mix with a little of the water, cold, until the whole becomes of the consistency of thick cream. Then gradually add the remainder of the water, which must be boiling, stirring well meanwhile to prevent lumps. Put the mixture over the fire, and stir until it boils; then let it stand until quite cold, when it should look like jelly. When you are ready for work add Spanish whiting, the mixture not to be too stiff to spread readily with the paste brush. Put through a fine wire sieve with a stiff brush, and it is ready for use.

(6611) S. F. S. says: 1. Would you be so kind as to print in your paper a receipt for mushroom catsup. A. Sprinkle the trimmed tops with salt, stir them occasionally for two or three days, then slightly press out the juice; add to each gallon of this ½ ounce each of bruised mustard seed and cloves and 1 ounce each bruised allspice, black pepper, and gently simmer for an hour in a porcelain-lined iron vessel; cool, strain, and bottle. 2. Also for wild cherry wine? A. Take of cold soft water, 10 gallons; cherries, 10 gallons; ferment. Mix raw sugar, 30 pounds; red tartar, in fine powder, 3 ounces; add brandy, 2 or 3 quarts. This will make 18 gallons. Two days after the cherries have been in the vat, take out about 3 quarts of the cherry stones, break them and the kernels, and return them into the vat again.

(6612) E. B. C. says: 1. Who is the author of the very best dictionary of hieroglyphics? A. Heinrich Brugsch, Worterbuch and Supplement, 3148 pages, published by the J. C. Hinrichssche Buchhandlung, Leipzig, at 820 marks. 2. Where can I get a 16 candle power 110 volt electric bulb lamp with a reflector inside of bulb? A. Address the Edison Lamp Works, Harrison, N. J.

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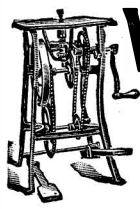

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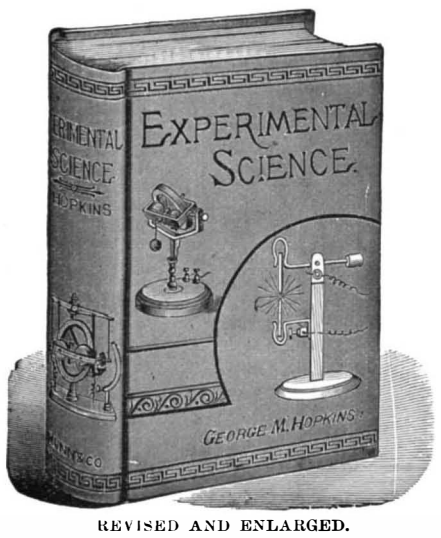

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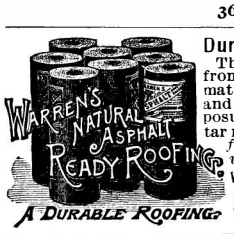

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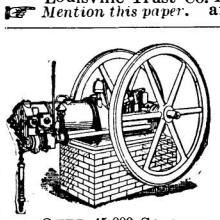

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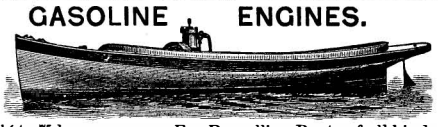

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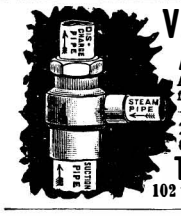

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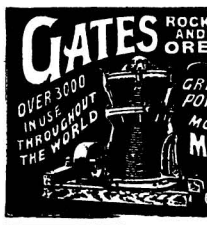

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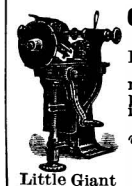

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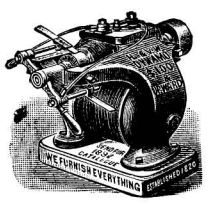

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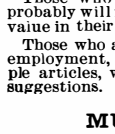

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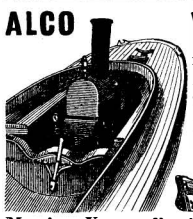

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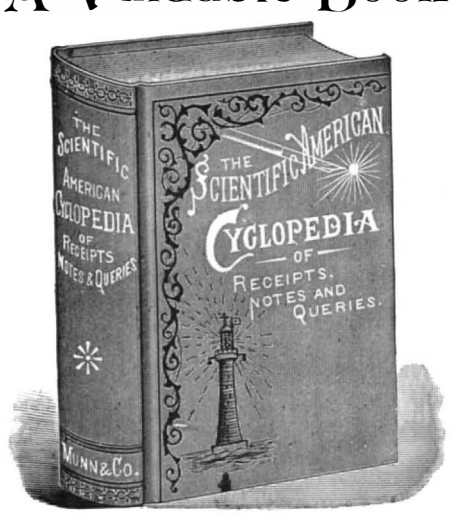

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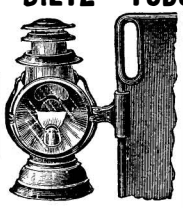

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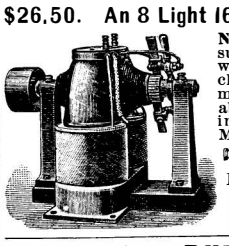

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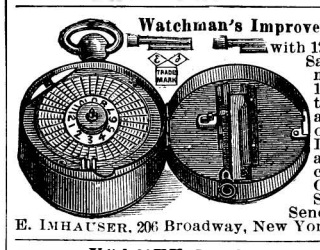

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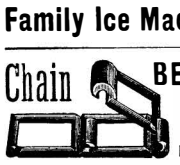

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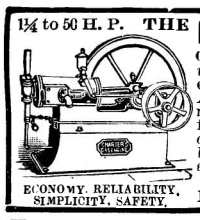

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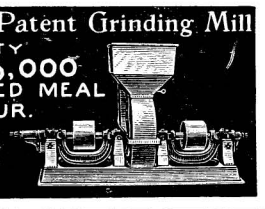

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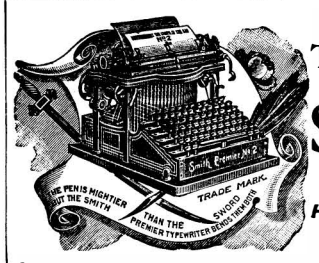

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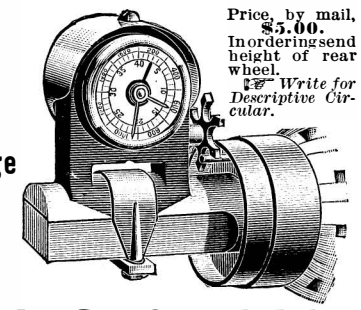

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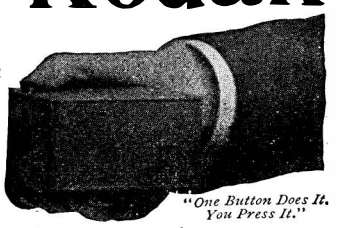

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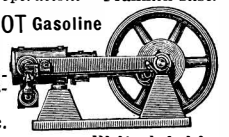

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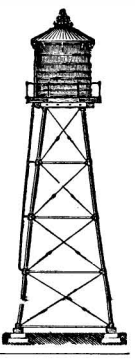

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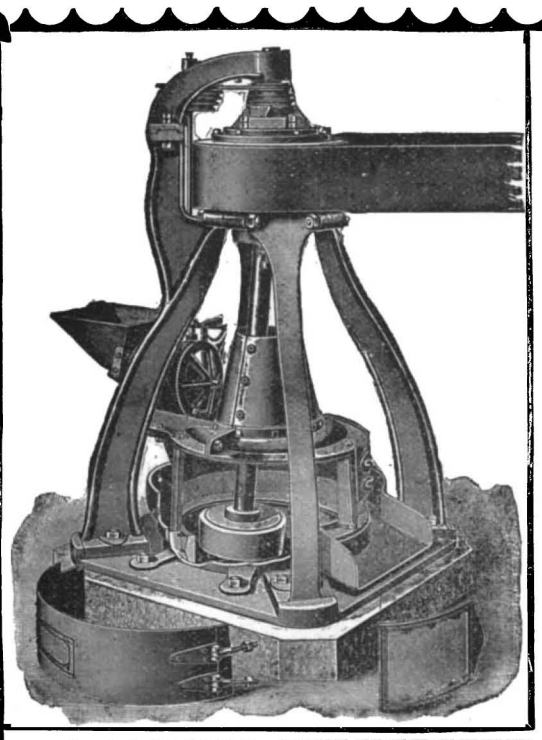

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